

4 100-HR

4.1 Overview

The 100-HR-3 Groundwater OU, in the northern Hanford Site, is within the 100-HR-D and 100-HR-H groundwater interest areas (Figure 1-2). Groundwater in this area was contaminated by waste releases associated with past operation of the D, DR, and H Reactors and associated support facilities. At the end of 2014, approximately 87 percent of the waste sites were classified as closed, interim closed, no action, not accepted, or rejected. That does not include the 100-D-100 waste site, which was excavated to the water table in 2013 and into the aquifer starting in December 2014. Hexavalent chromium was identified at 100-D-100 as a vadose zone source within the aquifer material, bound within a chromate-substituted calcite mineral precipitate ([SGW-58416](#), *Persistent Source Investigation at 100-D Area*).

Table 4-1 lists key facts about 100-HR. Additional details about 100-HR-3 history, waste sites, and hydrogeology are provided in Chapters 1 and 3 of the 100-D/H RI/FS ([DOE/RL-2010-95, Rev. 0](#)).

The location of monitoring, extraction and injection wells, and aquifer tubes are shown on Figures 4-1 and 4-2. Data from monitoring seeps and springs are shown on each of the plume figures presented, but were not used for plume development due to their transient nature. Plume mapping details, including descriptions of terms (e.g., Type 1 Control Point) in figure legends, are provided in Section 1.3.

Vadose zone thickness, which also represents the depth to groundwater, ranges from 0 to 27 m (89 ft), with an average thickness of 20 m (66 ft) in 100-D and an average thickness of 11.3 m (37.1 ft) in 100-H. Thickness of the unconfined aquifer ranges from less than 1 m (3.3 ft) in areas at 100-H to 12 m (39 ft) at 100-D, with the aquifer generally thinning from west to east. Average aquifer thickness varies from about 6 to 9 m (20 to 30 ft) beneath 100-D, and from 2 to 5 m (7 to 16 ft) beneath 100-H. The thickness of the unconfined aquifer mimics the topography of the RUM ([DOE/RL-2008-42](#)). The uneven surface of the silt and clay-rich RUM forms the base of the unconfined aquifer. Water-bearing units are found within the RUM, forming confined or semiconfined aquifers across 100-HR. It is unclear if the water-bearing units within the RUM are connected across the site, or are small isolated areas, since there are only a few wells completed in these water-bearing units.

Table 4-1. 100-HR at a Glance

Reactor operations: D: 1944–1967; DR: 1950–1964; H: 1949–1965				
2014 Groundwater Monitoring				
Contaminant	Water Quality Standard	Maximum Concentration	Plume Area^a (km²)	Shoreline Impact (m)
Hexavalent chromium	10 µg/L ^b	3,616 (199-D5-104) ^c	7.0 ^d	0 ^d
Nitrate	45 mg/L ^e	53.1 mg/L (199-D4-20)	0	0
Strontium-90	8 pCi/L ^f	36.4 pCi/L (199-D5-132)	0.02	25
Tritium ^g	20,000 pCi/L ^f	20,400 pCi/L (199-D4-20)	—	—
Remediation				
<p>Waste sites (interim action): 87 percent complete^h</p> <p>Groundwater (interim action for hexavalent chromium):</p> <ul style="list-style-type: none"> • HR-3 P&T: 1997-2011, removed 406 kg • DR-5 P&T: 2004-2011, removed 338 kg • DX P&T: 2010-2014, removed 1,403 kg • HX P&T: 2011-2014, removed 93 kg • ISRM: 1997-2012 <p>Final ROD anticipated in 2015/2016.</p>				

a. Estimated area at a concentration greater than the listed water quality standard.

b. The applicable standard is the 10 µg/L surface water quality criterion. A 20 µg/L groundwater interim action cleanup target for inland groundwater was identified in RD/RA Work Plan (DOE/RL-96-84) for interim remedial action based on an assumed 1:1 dilution of groundwater entering the river. The interim remedial action objective remains to protect the Columbia River against releases that would cause exceedance of the 10 µg/L surface water quality criterion

c. Table lists maximum value from a sample collected during 2014 that is not flagged as suspect data.

d. This area is for the plume within the 100-HR-3 interest area during low river stage conditions.

e. 45 mg/L as NO₃ is equivalent to the drinking water standard of 10 mg/L as N

f. Drinking water standard

g. Tritium was detected in a single well above the DWS of 20,000 pCi/L. No plume area was calculated.

h. Sites with closed, interim closed, no action, not accepted, or rejected status as of 12/31/2014.

ISRM = In Situ Redox Manipulation

P&T = pump and treat

ROD = Record of Decision

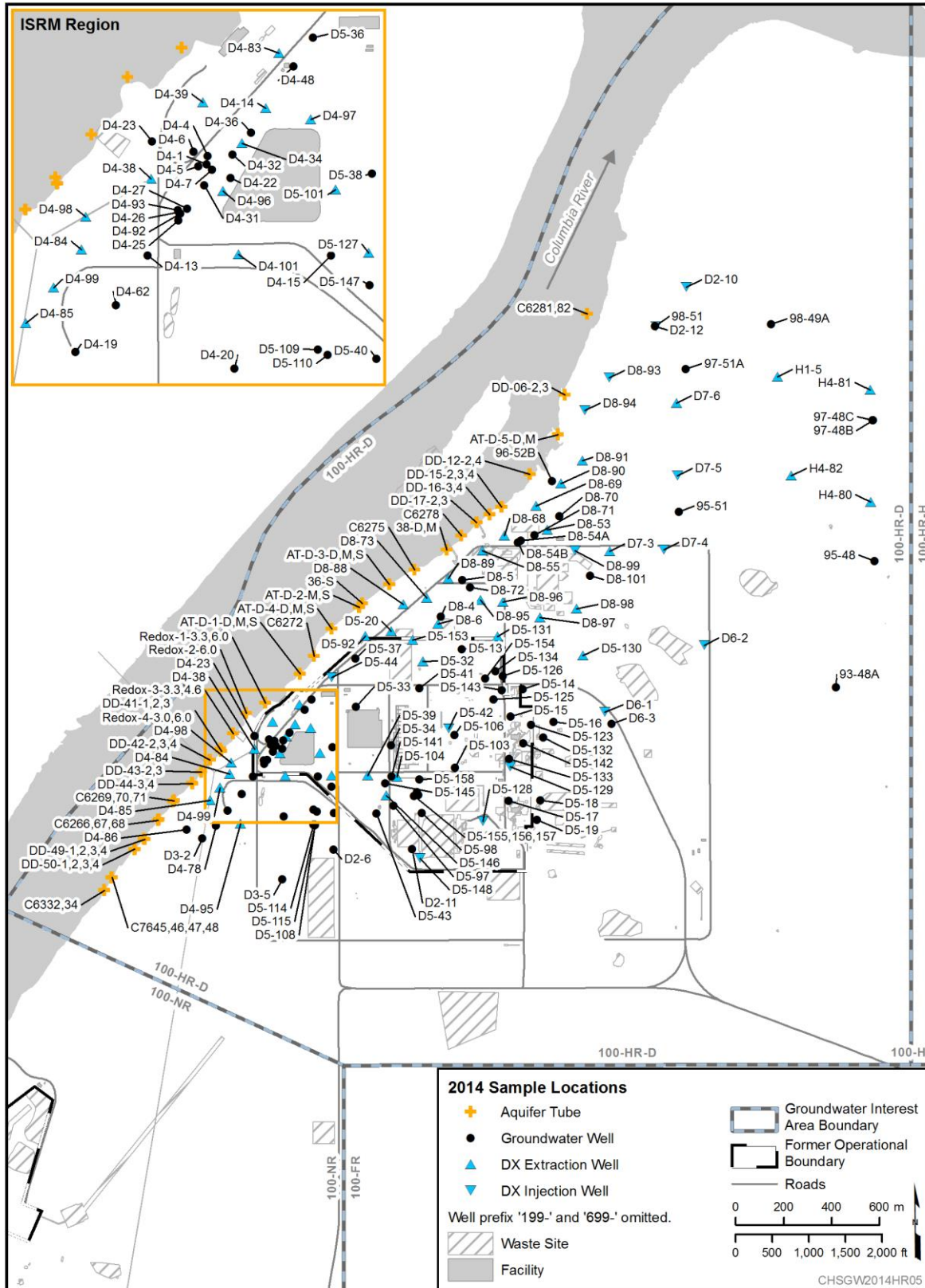


Figure 4-1. 100-HR-D Wells and Aquifer Tubes

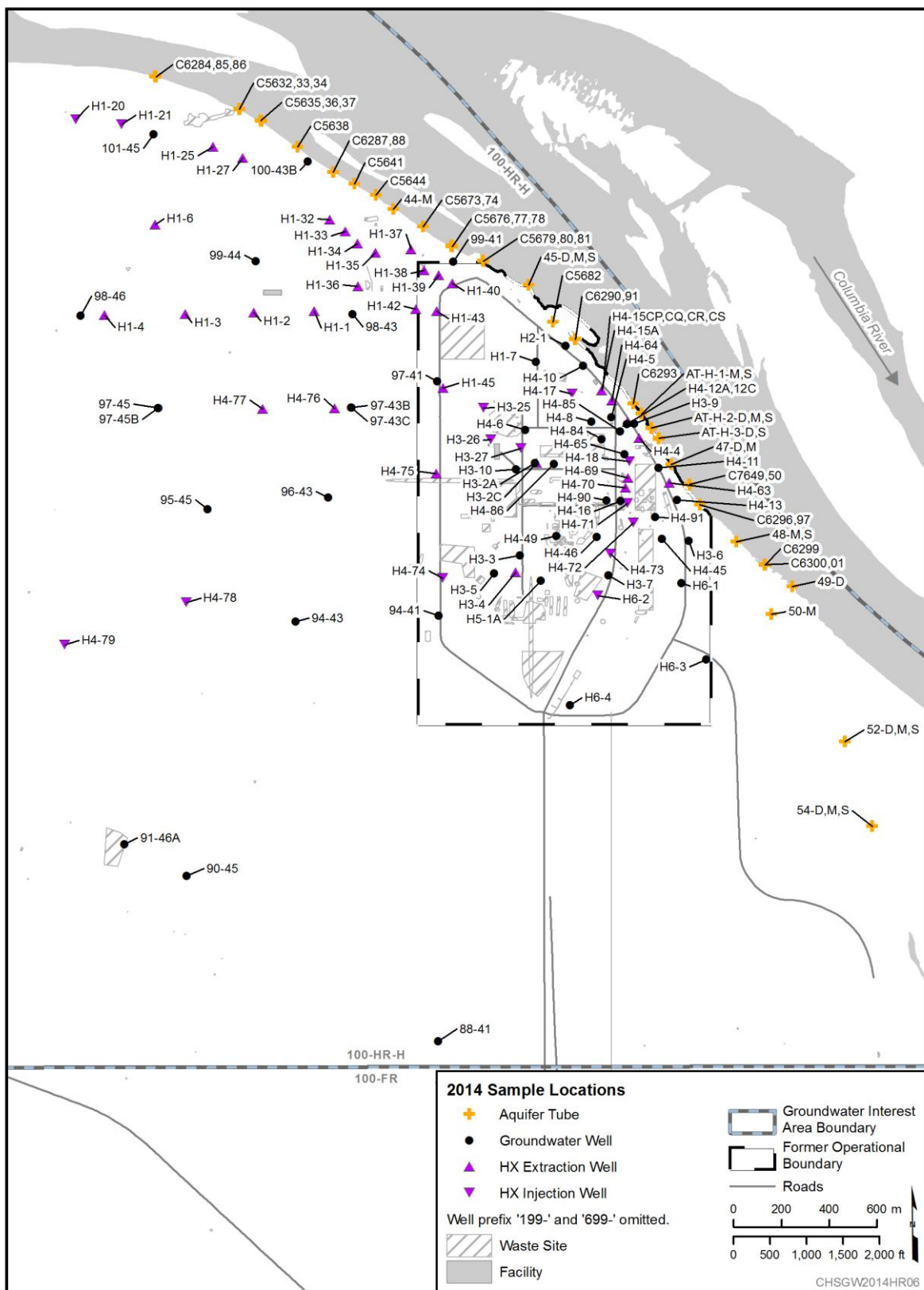


Figure 4-2. 100-HR-H Wells and Aquifer Tubes

The unconfined aquifer is primarily present in the Ringold Formation unit E sands and gravels in 100-D, and in the Hanford formation gravels in 100-H (Figure 4-3). Across the Horn, the geology is transitional, changing from predominantly Ringold unit E (closer to 100-D) to Hanford formation farther east. Pockets of Ringold unit E are found as remnants in various locations. In the areas across the Horn where Ringold unit E is absent, channels formed, resulting in preferential groundwater flow pathways. This complicated geology is discussed in detail in Chapter 3 of [DOE/RL-2010-95](#).

Generalized Hydrogeology of 100-HR-3

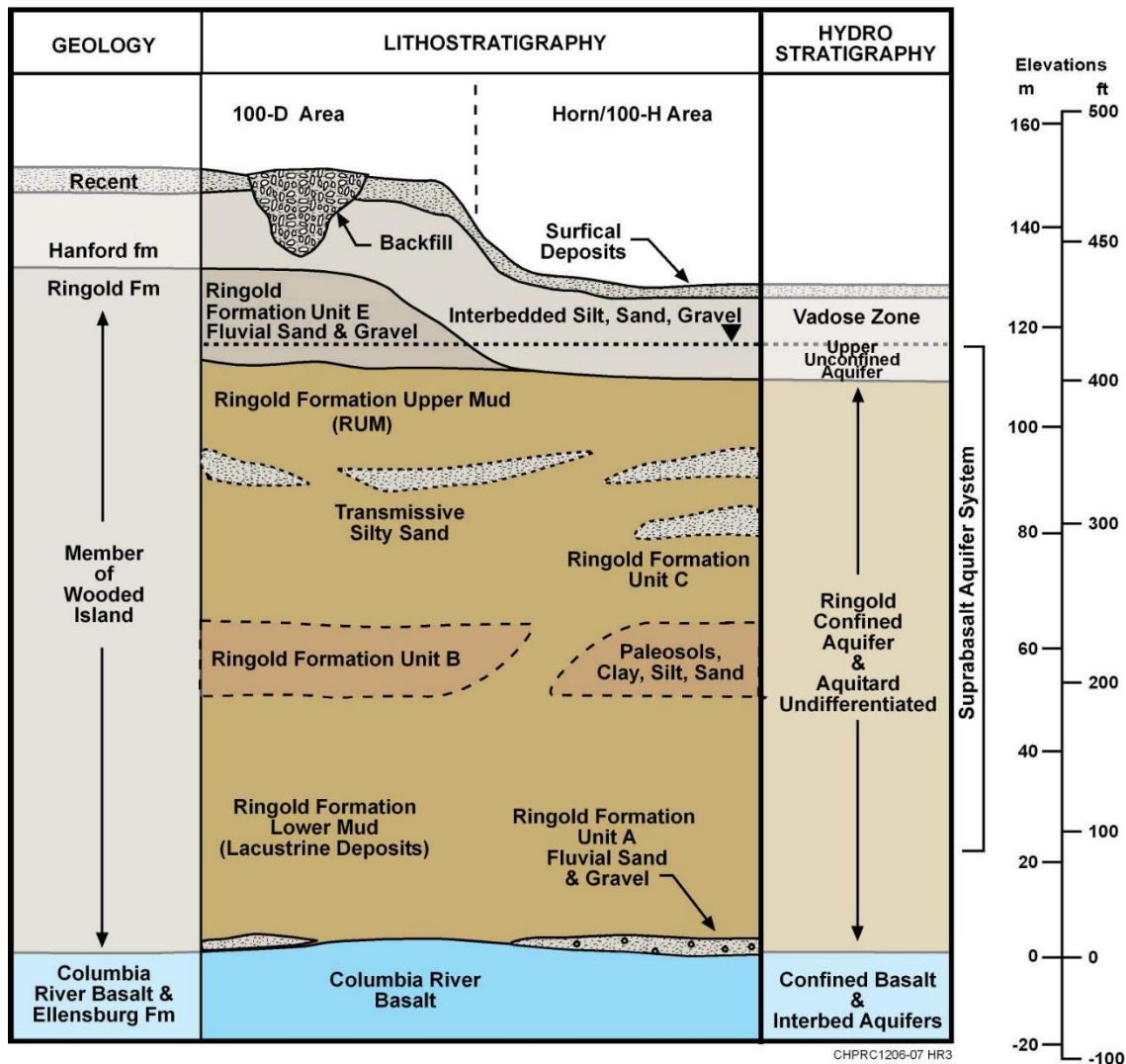


Figure 4-3. 100-HR Geology

Groundwater in 100-HR flows generally to the east-northeast direction, from 100-D across the Horn, toward 100-H. Flow in 100-H is to the east and northeast, generally towards the river. In the southern and central portions of 100-D, groundwater flows to the northwest, towards the Columbia River.

The hydraulic gradients are generally flatter during high river stage (ranging from approximately 0.0014 to 0.0023) when compared to low river conditions (ranging from approximately 0.0017 to 0.0031). Operation of P&T systems has created changes in groundwater flow direction and velocity throughout 100-HR-3. These changes are expressed as depressions and mounds in the water table, often very

localized, affecting the local flow direction and gradient. The March 2014 water table (Figures 4-4 and 4-5) shows the overall flow for the area. However, the flow directions and gradients experienced during low and high river stage have a greater effect on contaminant transport in the River Corridor than is represented by the March water table map. The water table contours for high and low river stage are included on the plume maps for hexavalent chromium.

Daily and seasonal fluctuations in the river stage (Figure 4-6) affect groundwater flow in 100-HR. As would be expected, longer term changes in the river stage produce more extensive and longer lived changes in the water levels, hydraulic gradient, and flow directions in the unconfined aquifer. The high and low river stages, which typically last a period of a few months, affect the groundwater flow near the river and extend some distance inland depending mostly on geology. The 2014 water level was more typical than the last several years, which had high flows in 2011 and 2012, and fluctuating flows during high river stage in 2013. The high flow periods in 2011 and 2012 resulted in a pronounced groundwater flow reversal during the high river stage. In 2013, this effect was muted and groundwater flow was towards the river during most of the year. As a result of the more typical river stage in 2014, some groundwater flow reversal was exhibited during high river stage, although not as extreme as in 2011 and 2012.

COPCs in the 100-HR unconfined aquifer were identified in the interim ROD (Tables 1 and 2 of [EPA/ROD/R10-96/134](#)) and include hexavalent chromium, total chromium, nitrate, technetium-99, strontium-90, tritium, and several others. Within the unconfined aquifer, vertical stratification of hexavalent chromium has been identified in areas where highly concentrated sodium dichromate was handled. However, the stratification is not well defined or consistent within the aquifer. Measurements and observations continue to indicate the presence of hexavalent chromium in the first water-bearing sand unit within the RUM.

The 183-H Solar Evaporation Basin site is monitored under the Hanford Facility RCRA Permit and the *183-H Solar Evaporation Basins Postclosure Plan* ([DOE/RL-97-48](#)). Monitoring of the 183-H waste site includes total chromium, hexavalent chromium, nitrate, uranium, technetium-99, and fluoride. Of the contaminants monitored under the RCRA Permit, only hexavalent chromium, nitrate and uranium have periodic exceedances of the DWS and/or Permit levels (discussed later in this chapter).

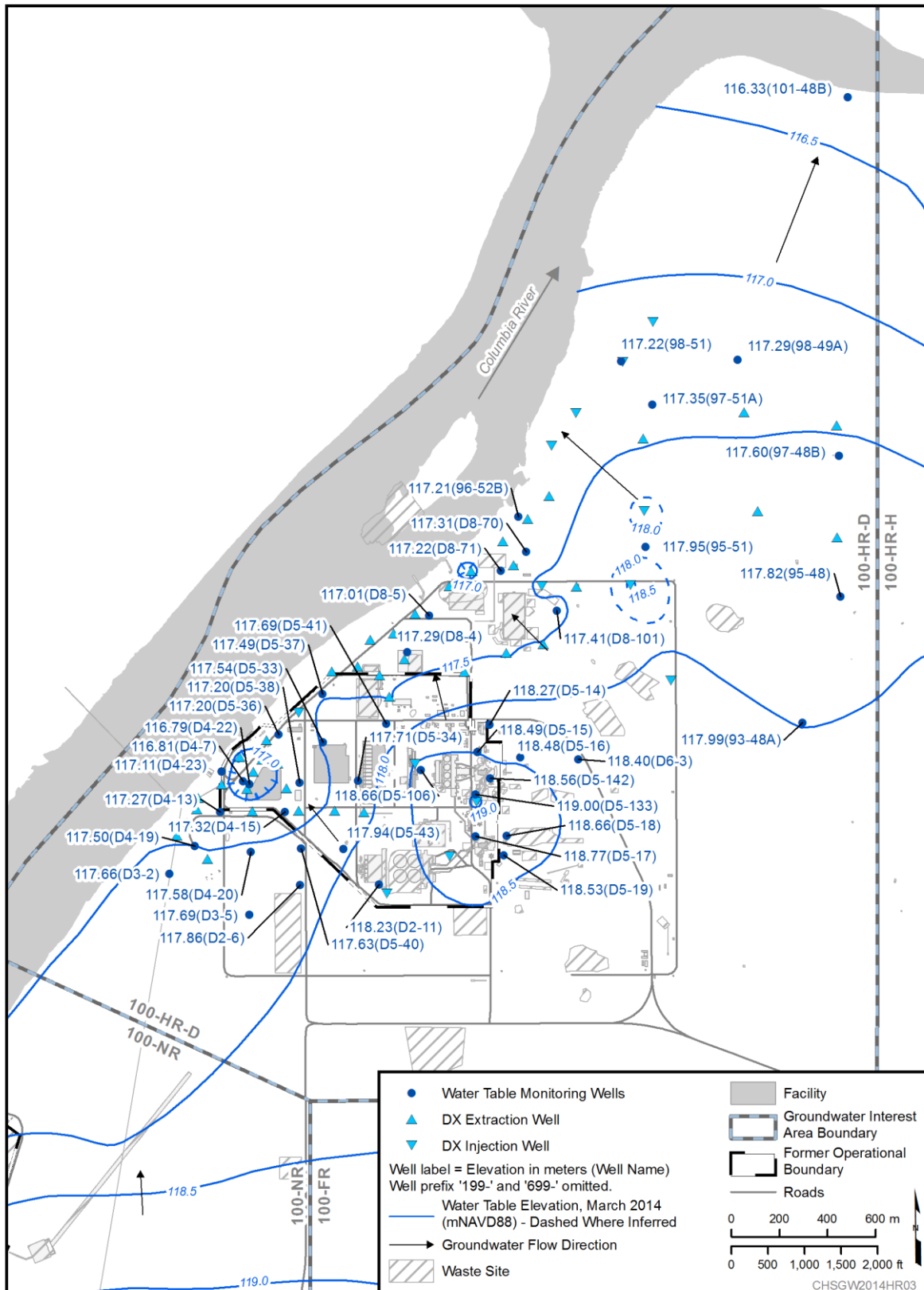


Figure 4-4. 100-HR-D Overview and March 2014 Water Table

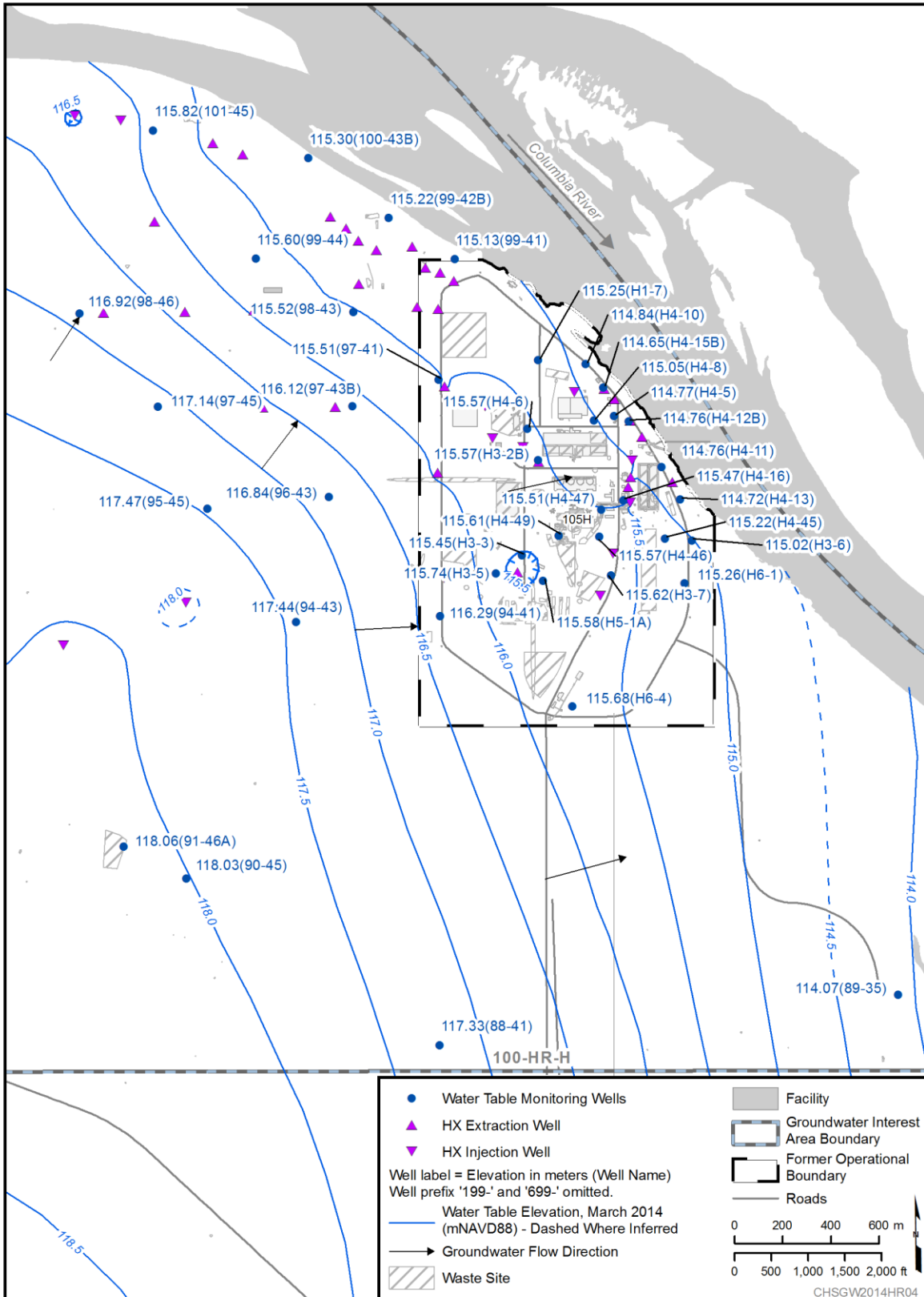
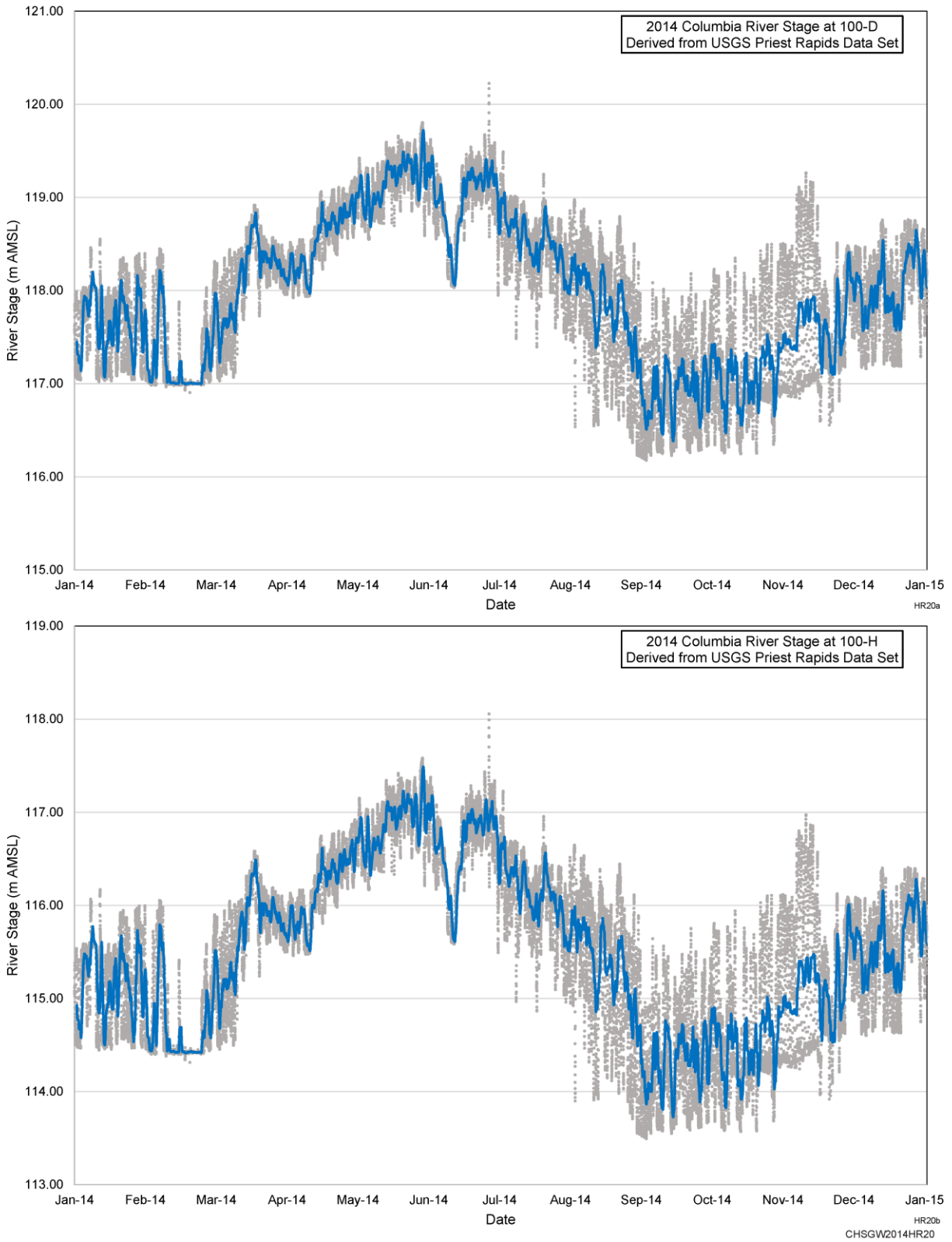


Figure 4-5. 100-HR-H Overview and 2014 Water Table

**Figure 4-6. Columbia River Stage at 100-D and 100-H Area in 2014**

4.2 CERCLA Activities

CERCLA groundwater activities in 100-HR-3 included groundwater monitoring; operation and optimization of interim remediation systems for hexavalent chromium (including adding new wells and realigning existing wells); and finalizing the RI/FS document. CERCLA groundwater sampling includes monitoring the effectiveness of interim remedial actions and monitoring wells throughout 100-HR to track plumes, plume areas (Figure 4-7; Table 4-1), and concentration trends. Wells sampled during 2014 are shown on Figures 1-1 and 1-2 and are listed in Appendix A, Table A-7. Appendix C lists aquifer tubes sampled in 2014.

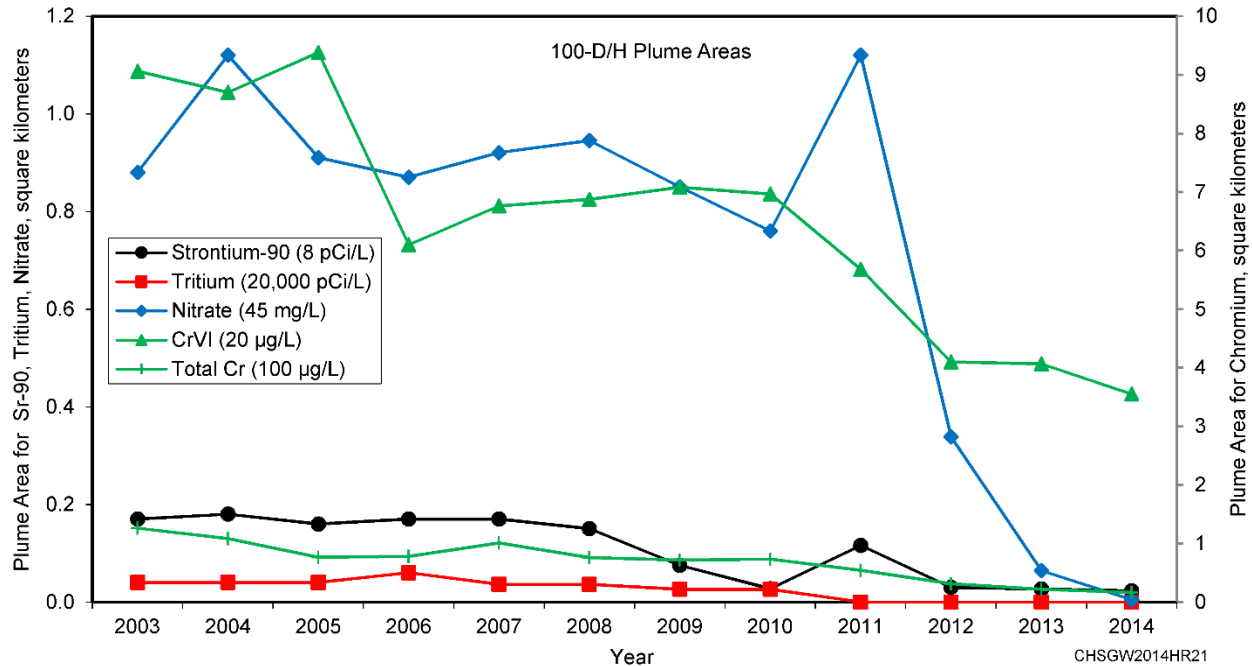


Figure 4-7. 100-HR Plume Areas

4.2.1 Remedial Investigation/Feasibility Study

In 2010 and 2011, the DOE conducted extensive field studies as described in an RI/FS work plan addendum ([DOE/RL-2008-46-ADD1](#)) and SAP ([DOE/RL-2009-40](#)). Changes to the SAP were documented in Tri-Party Agreement Change Notices ([TPA-CN-460](#) and [TPA-CN-368](#)).

The RI/FS results were evaluated, and DOE submitted Draft A of the RI/FS and Proposed Plan for 100-D/H in late 2012 ([DOE/RL-2010-95](#); [DOE/RL-2011-111](#)). The RI/FS was reviewed by Ecology, revised, and approved as Rev. 0 in October 2014. The RI/FS results support selection of final remedies under CERCLA, using an approach that integrates source and groundwater remedial actions, which is documented in the Proposed Plan. The Proposed Plan is currently being prepared and is expected to be available for public comment in 2015 or 2016. After public comments are received and incorporated, a ROD will be issued that identifies the final remedial alternatives.

Remedial action decisions will address the integrated cleanup of source waste sites and groundwater. The general objectives for all of these decisions is to protect human health and the environment, including restoring groundwater to beneficial use and protecting aquatic life in the Columbia River from exposure to site groundwater contaminants exceeding ambient water quality criteria.

4.3 100-HR-D Hexavalent Chromium

Hexavalent chromium is the primary contaminant, is present across the majority of 100-HR-3, and has the most expansive distribution of the contaminants. Its presence resulted from historic releases of two different types of wastewater contaminated with chromium. The first type of release included spills, leaks, and limited quantity intentional discharge of concentrated sodium dichromate solutions used as feed chemicals for conditioning reactor cooling water. The second type of release included spent reactor cooling water from retention basin leaks and intentional discharges to the 116-DR-1&2 Trench during an infiltration test in 1967, which had high volumes of water with lower concentrations of sodium dichromate.

The conceptual site model for hexavalent chromium in the River Corridor has previously assumed that it moves readily through the vadose zone with the addition of water. Once reaching groundwater, it was thought to all be mobile, moving easily within the aquifer regardless of the sodium dichromate concentration of the source. This conceptual site model still appears to be accurate for areas where low concentrations of sodium dichromate were released to the environment, such as with cooling water discharged to the 116-DR-1&2 Trench. However, the aquifer investigation at the 100-D-100 waste site, which was the result of high-concentration sodium dichromate releases, indicates a different conceptual site model. At the 100-D-100 waste site, data indicate that chromium-substitute calcite was precipitated in the periodically rewetted zone and within the aquifer sediment. Most of the mass associated with the precipitate is found near the water table and in the upper portion of the aquifer material. The presence of chromium-substitute calcite provides a slow leaching source of hexavalent chromium to the aquifer, resulting in a long-term secondary source ([SGW-58416](#)). The discovery of this mineral led DOE to remove this source material from below the water table at 100-D-100. Removal of this type of secondary source material, where present, has the potential to greatly decrease the time frame and costs of groundwater remediation.

Within 100-D, the plume is separated into 100-D south and 100-D north (Figures 4-9 and 4-10). Due to ongoing waste site remediation and P&T operations, the high concentrations within the plume are decreasing rapidly. For example, Well 199-D5-122 (Figure 4-11) had a significant decline in concentrations after the startup of the DX system. In extraction Well 199-D5-104, which is directly downgradient from the 100-D-100 waste site that was remediated during 2014, hexavalent chromium concentrations dropped from 5,392 µg/L in April 2013 to 465 µg/L on December 29, 2014 (Figure 4-12). Throughout the 100-D Area, hexavalent chromium concentrations have declined by an order of magnitude and were below 500 µg/L by the end of 2014. More information on remediation of the hexavalent chromium plumes in the 100-HR-3 OU is available in *Calendar Year 2014 Annual Summary Report for the 100-HR-3 and 100-KR-4 Pump-and-Treat Operations, and 100-NR-2 Groundwater Remediation* (DOE/RL-2015-05)

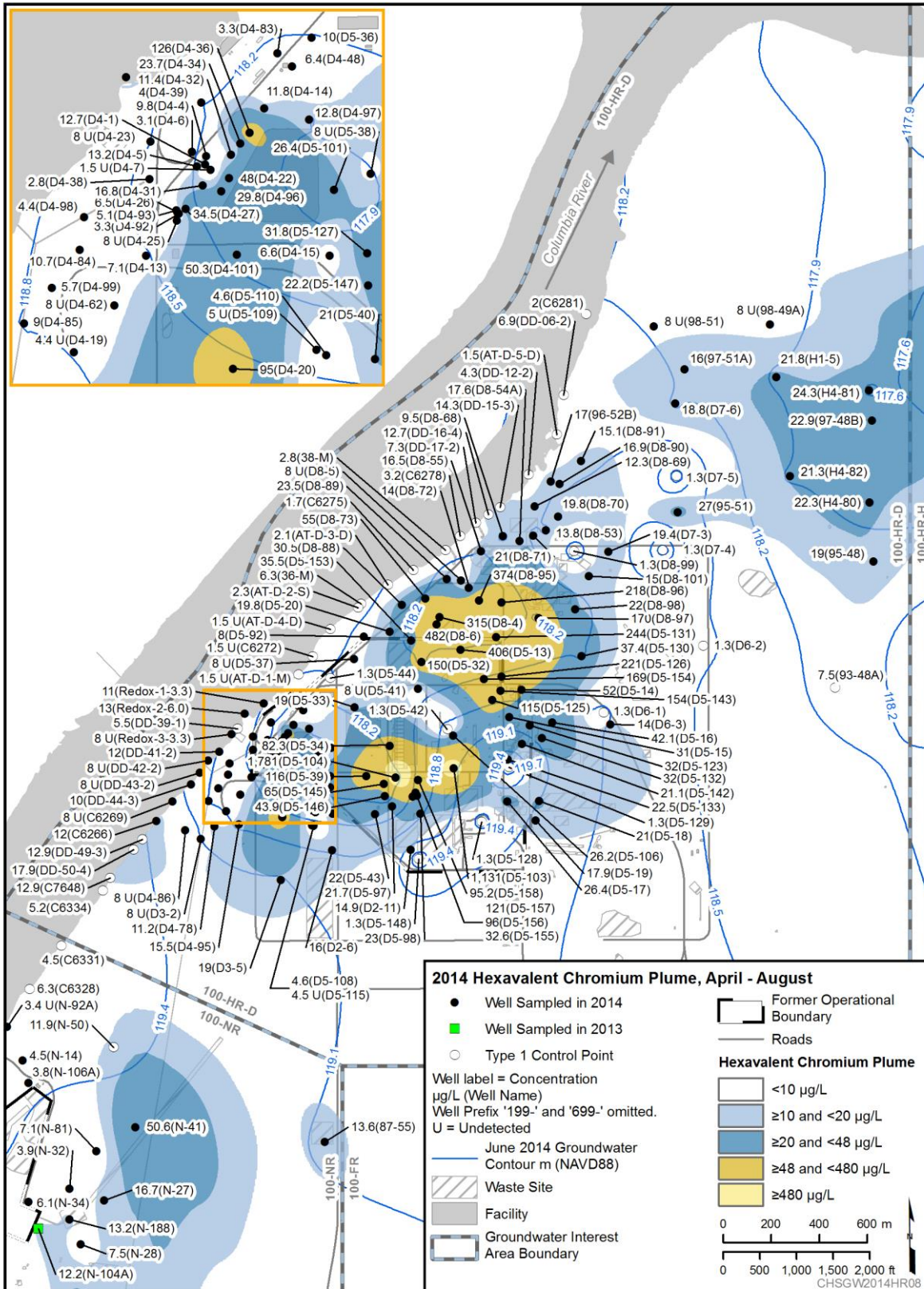


Figure 4-10. 100-HR-D Hexavalent Chromium Plume, Spring/Summer 2014 (High River Stage)

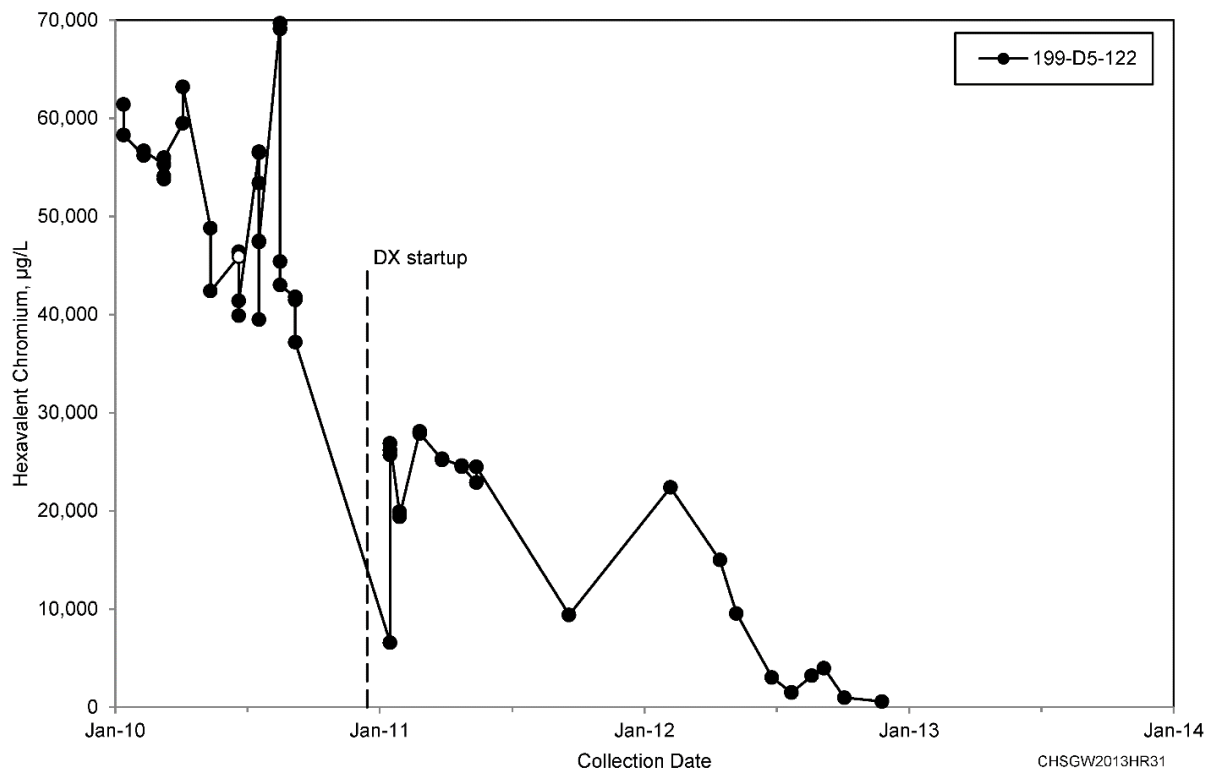


Figure 4-11. 100-HR Hexavalent Chromium Data for Well 199-D5-122 (Decommissioned)

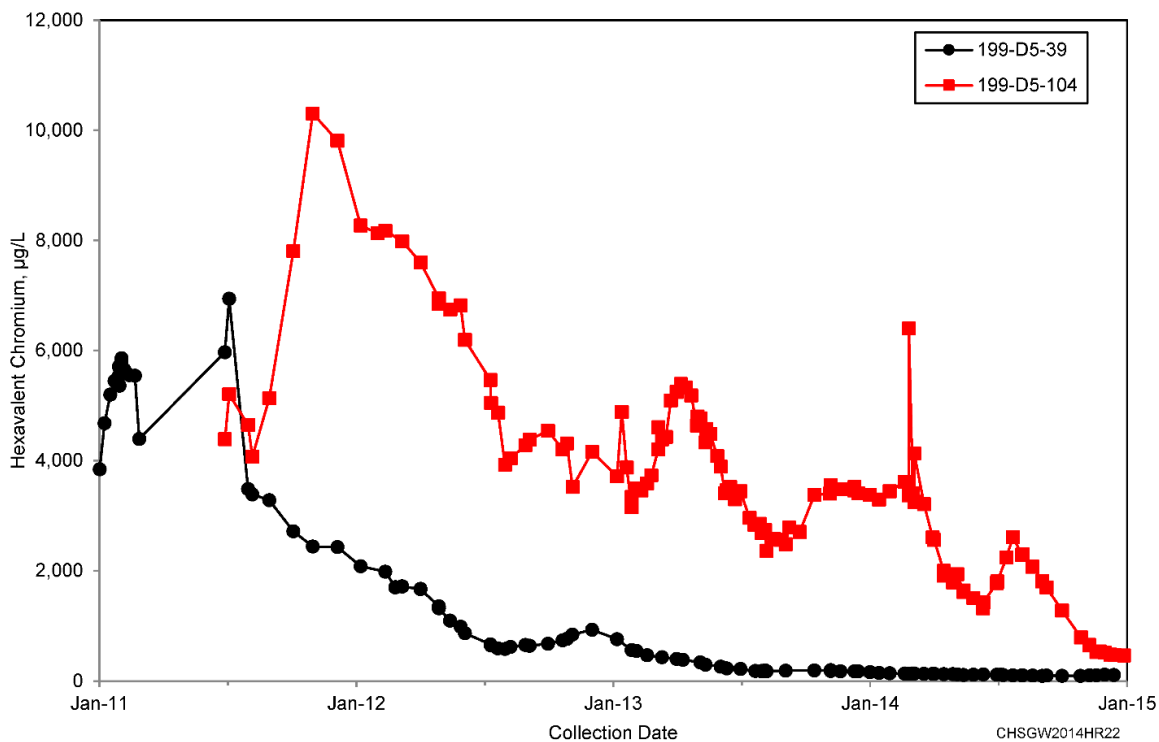


Figure 4-12. 100-HR Hexavalent Chromium Data for Wells 199-D5-39 and 199-D5-104

4.3.1 Southern Plume at 100-D

Hexavalent chromium concentrations continued to decline across the southern part of 100-D, with concentrations below 500 µg/L. As the areas of greatest concentration are reduced, small areas are being identified where hexavalent chromium levels remain stable or are slowly increasing. These areas were masked previously by the overall high levels of contamination but now can be addressed through modifications of the P&T system that realign wells for focused localized extraction and injection.

In the southern part of 100-D, remaining pockets of contamination have been identified:

- At the 100-D-100 waste site
- Near Well 199-D5-103
- Near Well 199-D4-20
- At the northern end of the in situ redox manipulation (ISRM) barrier

The highest concentrations in 100-D south continue to be found in extraction Well 199-D5-104, located downgradient from the 100-D-100 waste site. Near the 100-D-100 waste site, hexavalent chromium concentrations have dropped dramatically over the last few years as a result of the expanded P&T system and source area remediation. Hexavalent chromium concentrations in downgradient extraction Wells 199-D5-104 and 199-D5-39 have been declining overall, but the trend slowed as the remediation activity at 100-D-100 approached groundwater (Figure 4-12). The aquifer is expected to respond favorably with the additional excavation into the top 3 m (10 ft) of the aquifer, which will remove most of the remaining mass that is currently bound in a chromate-substitute calcite.

Hexavalent chromium concentrations in 199-D5-103 increased sharply during late 2011 and 2012 after the DX system became operational (Figure 4-13). This was in direct response to the increase in water levels of about 1 m (3.3 ft) due to nearby injection. Well 199-D5-103 is located between the 100-D-100 (southern plume) and 100-D-104/100-D-30 (northern plume) waste sites and also appeared to respond to excavation activities at those waste sites. Concentrations at 199-D5-103 increased during excavation activities, likely due to enhanced vertical migration of hexavalent chromium through the vadose zone during excavation (concurrent excavation took place at the waste sites during most of 2013). Hexavalent chromium concentration decreased in late 2013 when excavation activities concluded (Figure 4-13). Final soil remediation at 100-D-104/100-D-30 stopped in March 2014 and in January 2015 at 100-D-100. During 2014, the hexavalent chromium concentration increased again to a maximum of 1,370 µg/L before decreasing and ending the year at 307 µg/L in December 2014. This trend during 2014 likely resulted from increased local recharge with the excavations open to the water table and indicates the removal of chromium-contaminated soil and aquifer material resulting in the declining concentration late in 2014.

Well 199-D5-34, located farther downgradient, also exhibited an increase in hexavalent chromium concentration following startup of DX. Starting in mid-2013, the concentrations in this well exhibited a general increase to about 215 µg/L at the end of 2013 (Figure 4-13), which may also have been related to the excavation activities at the two upgradient waste sites. The hexavalent chromium concentration transient curve for Well 199-D5-34 exhibits a similar nature to that exhibited by Well 199-D5-103, with Well 199-D5-34 exhibiting lower peak concentrations and the timing of the transient peaks and lows lag several months behind those exhibited in Well 199-D5-103. This relationship suggests that these two wells are likely oriented along a groundwater flow path and are exhibiting responses to the same conditions, with responses at Well 199-D5-34 being diminished by distance. If this relationship holds true, the hexavalent chromium concentration in Well 199-D5-34 should decrease during 2015. Continued monitoring at these two locations will provide further understanding of the hexavalent chromium behavior in this area.

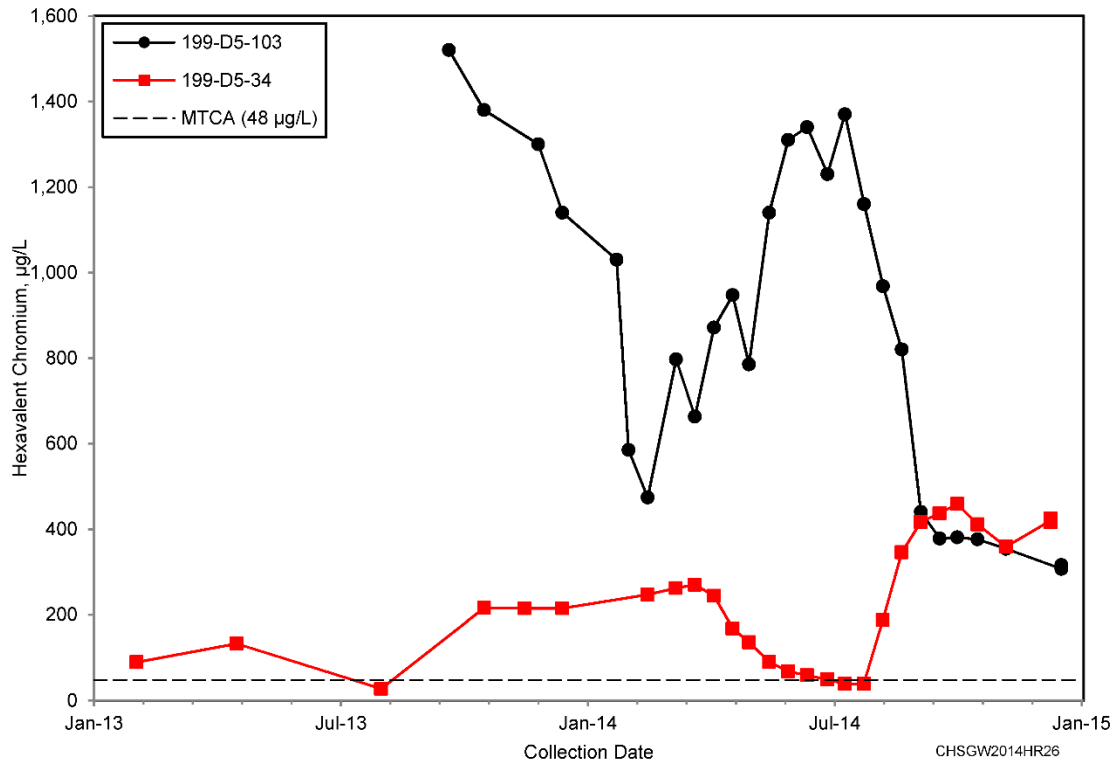


Figure 4-13. 100-HR Hexavalent Chromium Data for Wells 199-D5-103 and 199-D5-34

A third remaining area of elevated concentration in the southern plume is in the vicinity of Well 199-D4-20. Concentrations in this well were above 200 µg/L in 2005, and declined to 6.7 µg/L in August 2010. The hexavalent chromium concentration rose back up to 174 µg/L in September 2012. The most recent concentration at this well was 87 µg/L (October 2014). A remaining source area near Well 199-D4-20 has not been definitively identified. The wells surrounding Well 199-D4-20 have concentrations ranging from below detection to around 30 µg/L; however, these wells are located in either a treatability test area (upgradient) or are within the ISRM barrier (downgradient). Based on examination of historical hexavalent chromium concentrations in Well 199-D4-20 and neighboring wells, it appears that the chromium observed in Well 199-D4-20 is likely a remnant of the former hexavalent chromium plume that was continuous throughout the area inland of the ISRM barrier wells. This plume has been dissected by operation of the pump and treat system, as well as by placement of the ISRM barrier and emplacement of the in situ bio-reduction test to the east of Well 199-D4-20.

In the northern portion of the ISRM barrier, hexavalent chromium concentrations have remained elevated for several years. As a result, the need for improved capture by the P&T system in this area was identified in 2012. In response to this need, two additional extraction wells were connected during 2013: Wells 199-D4-14 and 199-D4-34 (Figure 4-14). This system modification has resulted in concentrations declining in most of the ISRM wells and in downgradient extraction Well 199-D4-39 (Figure 4-14). The source of this contamination is presumed to be the 100-D-100 waste site. Figure 2-25 of DOE/RL-2015-05 shows the hydraulic containment achieved by the P&T system in 100-D Area.

Based on measurements in aquifer tubes south (i.e., upriver) of the ISRM barrier and in monitoring wells immediately inland, hexavalent chromium appears to continue to reach the shoreline of the Columbia River at low river stage (Figure 4-9). At the high river stage (Figure 4-10), the plume in this area is discontinuous, with inland wells 199-D3-2 and 199-D4-86 exhibiting no detectable hexavalent chromium.

Not all of the nearby aquifer tubes were sampled at the high river stage (some aquifer tubes are not accessible during high river stage). Aquifer tubes in the vicinity that were sampled during high river stage exhibited varying results, ranging from non-detectable to some locations exceeding 10 µg/L (e.g., aquifer tube C6268 at 19.2 µg/L). Based on these observations the hexavalent chromium plume in this vicinity is inferred to migrate to the river periodically.

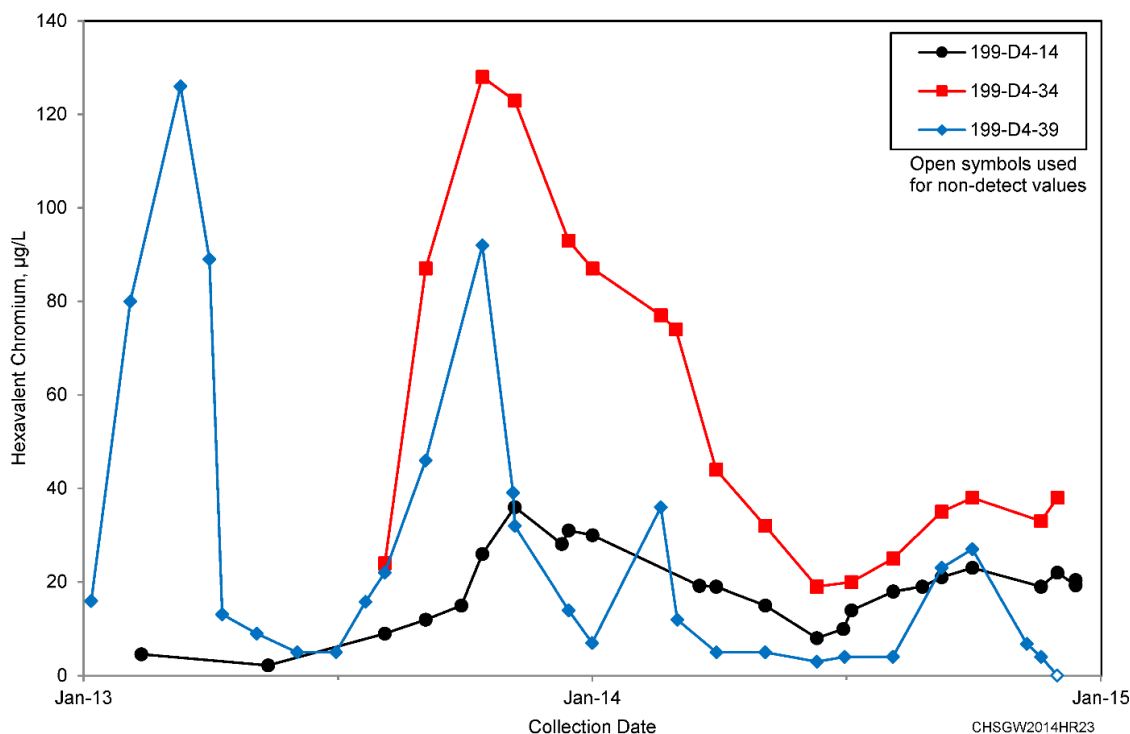


Figure 4-14. 100-HR Hexavalent Chromium Data for Wells 199-D4-14, 199-D4-34, and 199-D4-39, Near ISRM Barrier

4.3.2 Northern Plume at 100-D

The overall footprint of the 2014 hexavalent chromium northern plume (Figures 4-9 and 4-10) contour changed little compared to the 2013 plume at the 10 µg/L. As in the southern plume area, the areas of higher concentrations decreased in size. The plume area with concentrations greater than 480 µg/L was smaller, and concentrations declined to less than 480 µg/L by the end of 2014. It should be noted that Well 199-D8-6 was not sampled after March 2014, and concentrations had not yet declined. The plume above 48 µg/L was about the same size as in 2013 and is not interpreted to extend to the river. Most of the reductions in concentration were in response to active groundwater remediation, with source area removal at waste sites such as 100-D-104/100-D-30, contributing to the decline.

The areas of higher concentrations (greater than 100 µg/L) remaining within the northern 100-D plume are located in the vicinity of the 120-D-1, 100-D Ponds waste site, the 126-D-1 coal ash waste site, and in the area northeast of those waste sites near the 100-D-31 underground pipelines. In general, wells upgradient of those waste sites have decreasing concentrations. Those wells near the waste site (199-D8-95, 199-D5-153, 199-D5-32, and 199-D8-4) and downgradient (199-D8-73, 199-D8-88, and 199-D8-89) show the effects of seasonal variations but no pronounced downward trend (Figure 4-15 and 4-16). New extraction Well 199-D5-153 was not included in the trend plot as it had a short operational time frame.

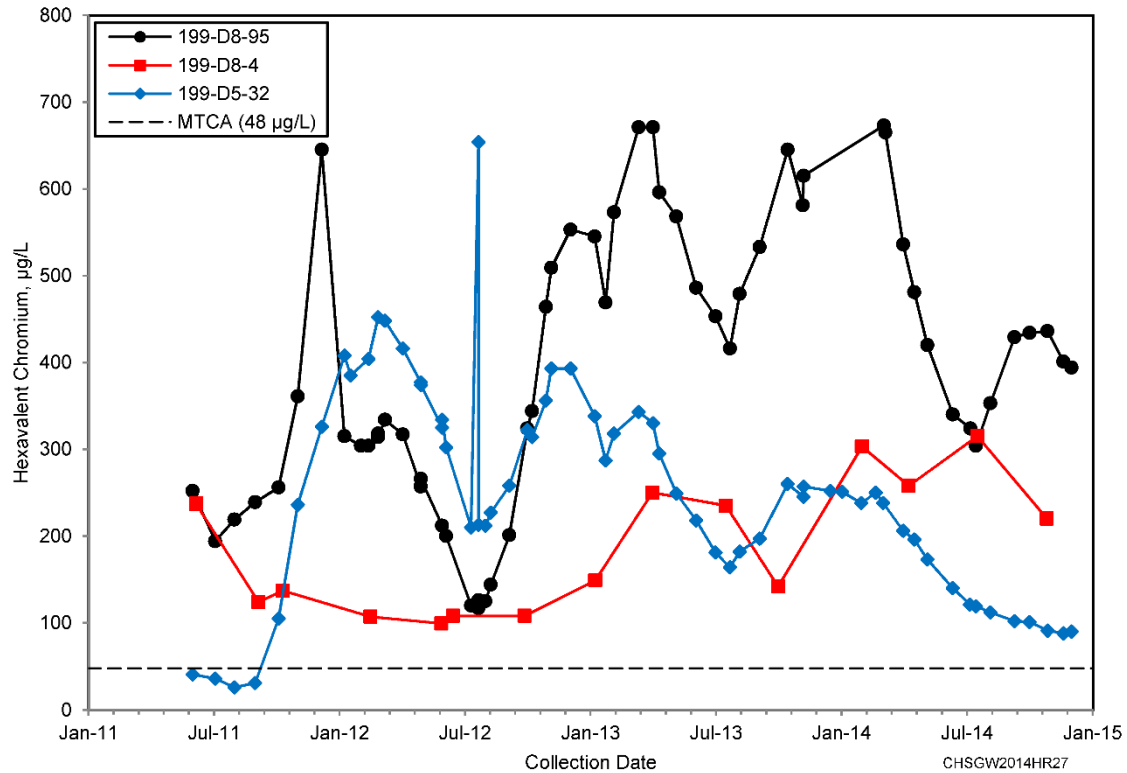


Figure 4-15. 100-HR Hexavalent Chromium Data for Wells 199-D5-132, 199-D8-4, and 199-D8-95, Northern Plume

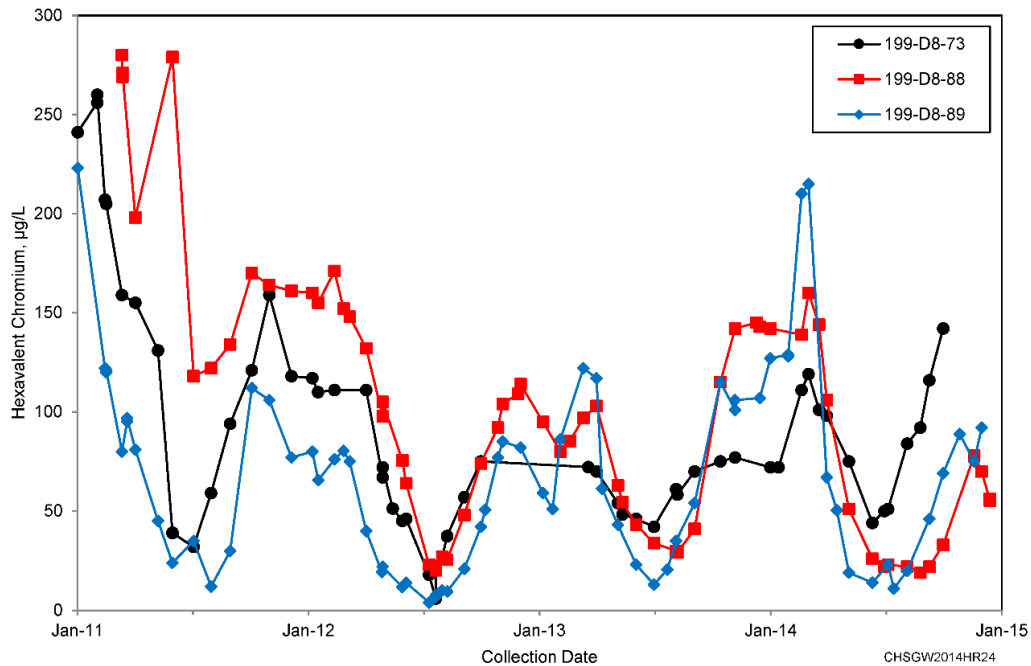


Figure 4-16. 100-HR Hexavalent Chromium Data for Wells 199-D8-73, 199-D8-88, and 199-D8-95, Northern Plume

Additional P&T capability was initiated in FYs 2013 and 2014 in response to elevated hexavalent chromium concentrations and impacts to the Columbia River near aquifer tube site AT-D-3 in 2013. This includes the addition of new extraction Well 199-D5-153, which is currently operational, and Well 199-D5-154, which is planned for startup in February 2015. Impacts from the operation of Well 199-D5-153 are already being realized, with concentrations in downgradient aquifer tubes declining. This increased mass removal in that area of the north plume, along with higher river stage, led to better capture and removal of hexavalent chromium, and lower concentrations in downgradient aquifer tubes. Figure 2-25 in DOE/RL-2015-05 illustrates the hydraulic containment of the hexavalent chromium plume in the 100-D Area.

Along the northern 100-D plume, hexavalent chromium continued to exceed 10 µg/L in aquifer tubes in fall 2014: DD-15-3 and DD-16-4, both located on the far north end. The capture in this area improved starting in 2013 as a result of system modifications. Changes included addition of new extraction wells, as noted above, and changes in water conveyance configuration that allowed increased pumping rates from selected extraction wells. The need for additional changes is being evaluated.

4.4 100-HR-H Hexavalent Chromium

4.4.1 Plume in the Horn and 100-H

Discharge to the 116-DR-1&2 Trenches during 1967 resulted in the hexavalent chromium plume that extends across the Horn from 100-D to 100-H (Figures 4-17 and 4-18; [DOE/RL-2010-95, Rev. 0](#)). This plume encompasses the largest area of 100-HR-3, but only a small area has concentrations greater than 48 µg/L. Ongoing remediation activities continue to reduce the contaminant levels; however the presence of a thin aquifer limits the effectiveness of the extraction wells. Across the Horn, the aquifer is less than 1 m (3.3 ft) in thickness in some locations during low river stage, which means that water cannot be withdrawn at a high rate of flow and removal of contaminants is minimized. Recent changes in extraction well design, including the use of larger well diameters, larger screen sizes and correspondingly larger filter packs, are expected to improve extraction performance in these areas of thin aquifer saturated thickness. Other alternative well construction techniques (e.g., the use of horizontal wells) are being evaluated for potential application in this area.

Currently, the highest concentrations in the unconfined aquifer in the Horn are found in extraction Wells 199-H4-75, 199-H4-76, and 199-H4-77; located just west of the 100-H Area. Concentrations in these extraction wells ranged from 41 to 60 µg/L in 2014, representing little change from 2013 levels. The slow decline in concentrations is likely related to the thin aquifer (less than 5 m [16 ft]), which results in extraction rates of less than 75.7 L/min (20 gpm) in these wells. Installation of new and/or replacement extraction wells that are better designed for operation in thin formations may improve performance in this area.

In the unconfined aquifer at H Reactor area, concentrations are typically less than 10 µg/L. Areas in 100-H with higher hexavalent chromium concentrations are found just north of H Reactor. One of these locations is at Well 199-H4-86, which is located just north of waste site 100-H-46. Well 199-H4-86, which was installed in 2013, had a high concentration of 85.5 µg/L in November 2014, during low river stage. Due to the consistent elevated concentrations during low river stage the well is planned for conversion to an extraction well in 2015.

The other areas with continuing hexavalent chromium are located at the 183-H Solar Evaporation Basin and the 116-H-7 Retention Basin, (Figures 4-17 and 4-18). Hexavalent chromium concentrations near the 183-H Solar Evaporation Basin were as high as 80 µg/L during 2014 (199-H4-84). Contaminant concentrations in this well are directly related to groundwater elevations, with the highest concentrations exhibited during high river stage as would be expected with a well located within a source area.

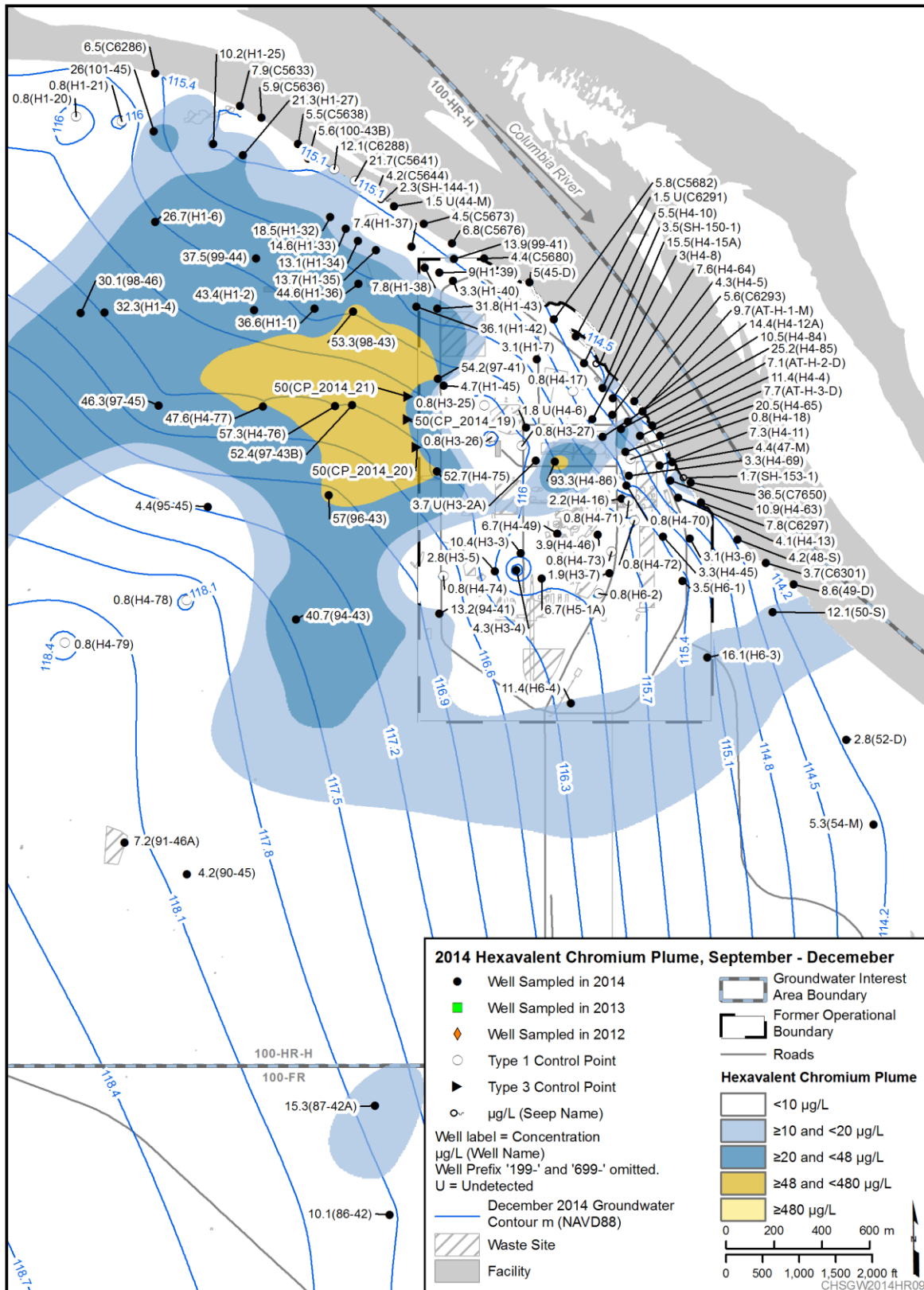


Figure 4-17. 100-HR-H Hexavalent Chromium Plume, Fall 2014 (Low River Stage)

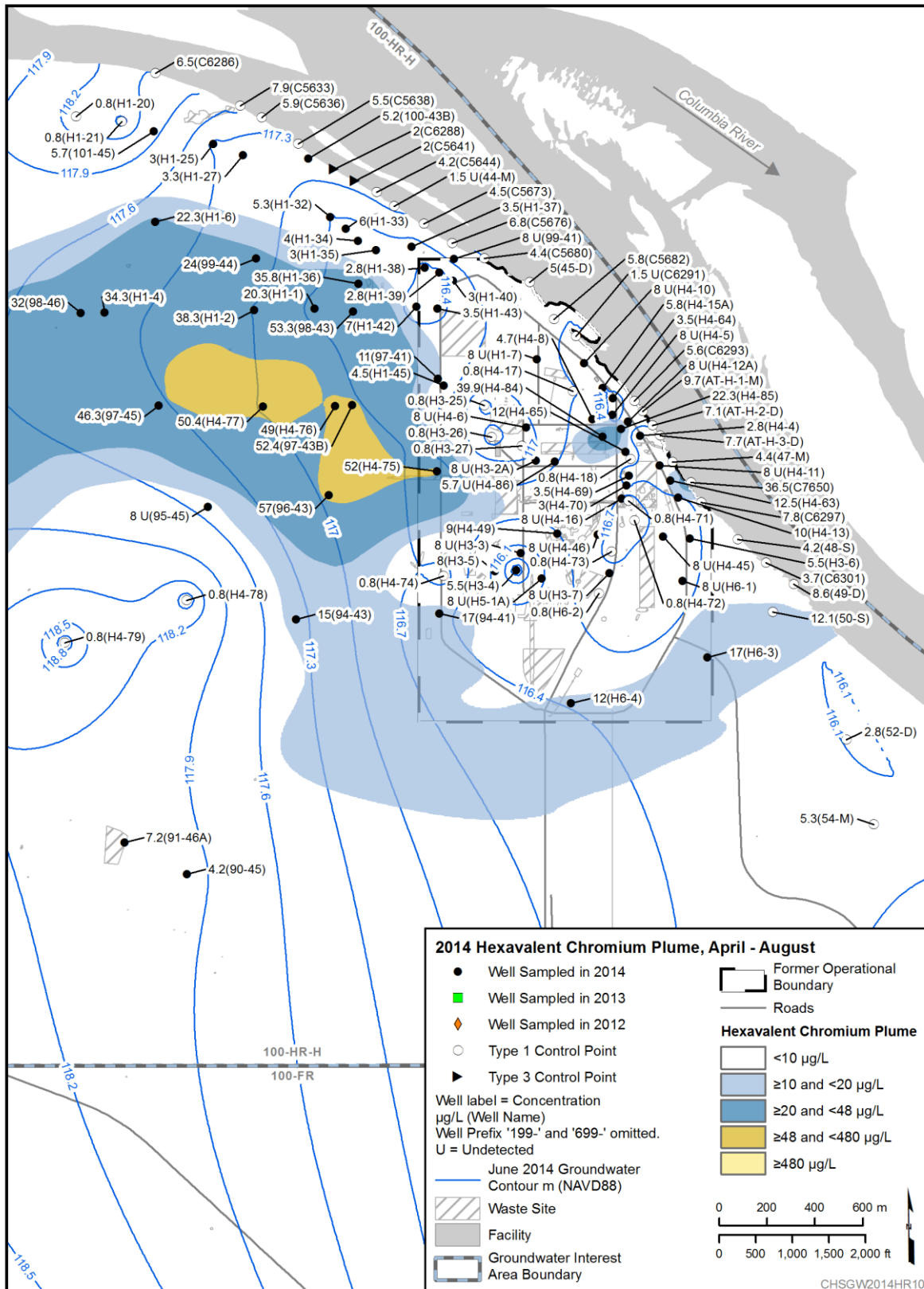


Figure 4-18. 100-HR-H Hexavalent Chromium Plume, Spring/Summer 2014 (High River Stage)

The southern edge of the 100-H Area (e.g. near Well 199-H6-3 and Aquifer Tube 50-S) continues to have fairly low levels of hexavalent chromium reaching the river, with the plume appearing to coincide roughly with an interpolated paleochannel. This apparent channel has a higher percentage of gravel material, and a slightly thicker aquifer, with groundwater flow rates that are much higher than in other areas in 100-H. Reconfiguration of the extraction and injection wells, along with installation of additional wells are planned in this area for 2015, which are designed to take advantage of the presence of the groundwater flow regime. Modifications to the P&T systems are discussed in the *Calendar Year 2014 Annual Summary Report for the 100-HR-3 and 100-KR-4 Pump-and-Treat Operations, and 100-NR-2 Groundwater Remediation* (DOE/RL-2015-05).

North of 100-H, hexavalent chromium was identified above 10 µg/L in Aquifer Tubes C6288 and C5641 during low river stage. This is an area where capture is difficult during low river stage because the aquifer is very thin, which minimizes the amount of water that can be extracted by the current groundwater extraction well network configuration. Well reconfiguration in this area is planned for 2015 (DOE/RL-2015-05) to improve capture. During high river stage, those aquifer tubes were assumed to have concentration below detection limits for mapping purposes. This is based on the specific conductance of those wells indicating that river water is being pulled to the extraction wells, plume capture being obtained (as discussed in DOE/RL-2015-05), and the presence of low concentrations inland/upgradient of those aquifer tubes indicating that the plume was not present along that portion of shoreline. Figures 4-19 and 4-20 present the specific conductance at 100-HR-3.

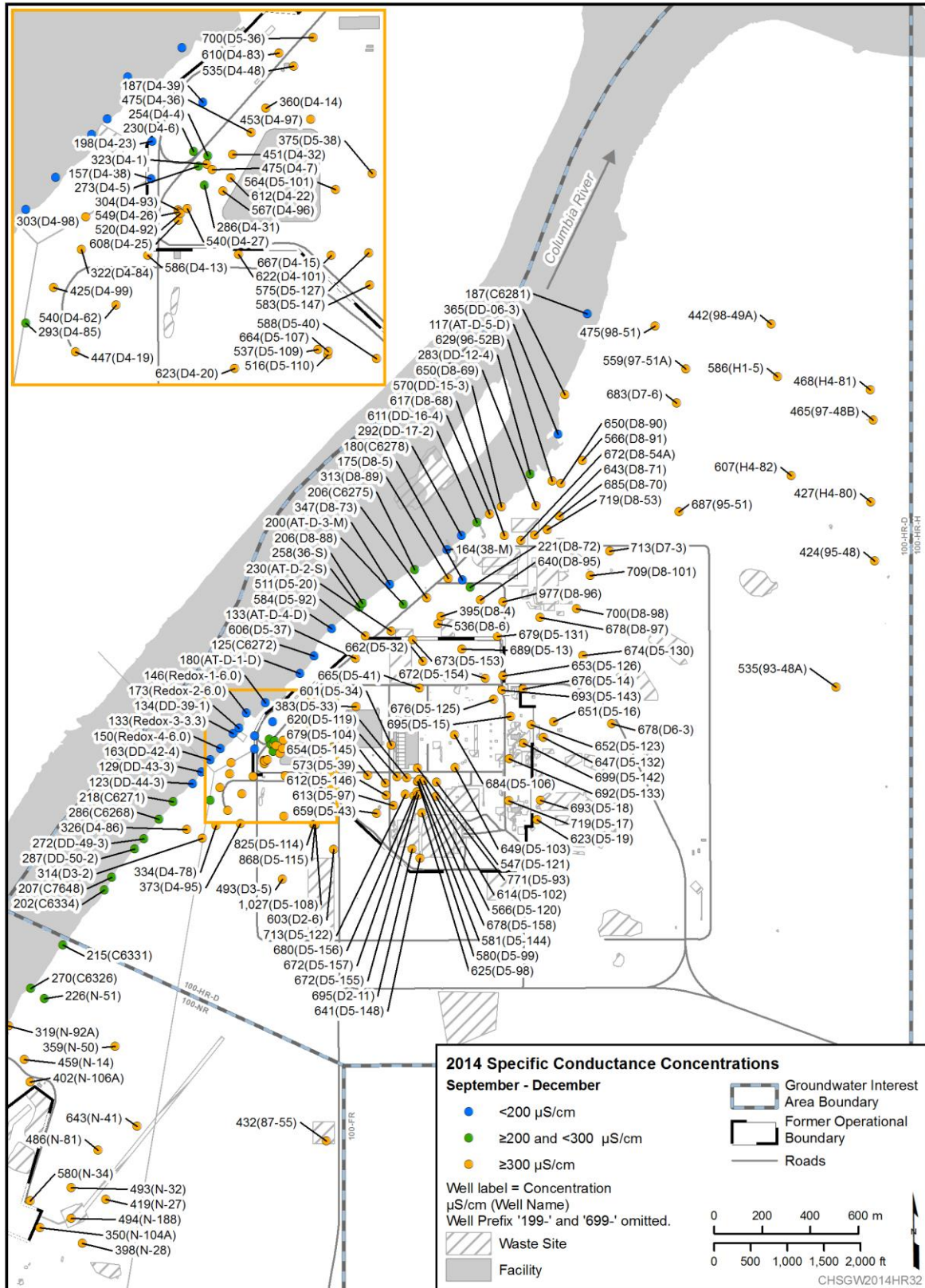


Figure 4-19. Specific Conductance, 100-HR-D Low River Stage

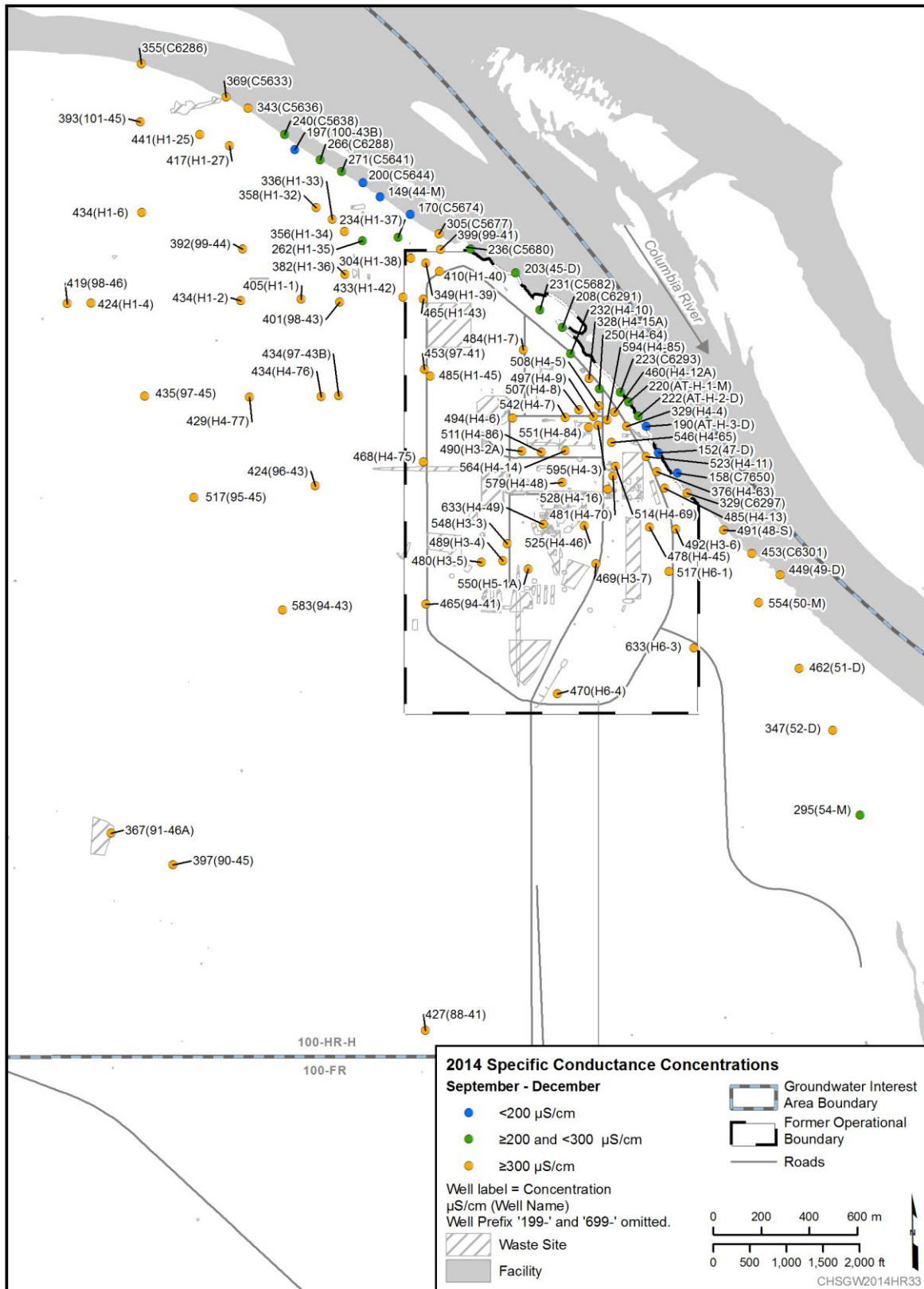


Figure 4-20. Specific Conductance, 100-HR-H Low River Stage

4.4.2 Ringold Formation Upper Mud Unit

Hexavalent chromium has been detected in the first water-bearing unit of the RUM in 100-H and the Horn for nearly 20 years. The water-bearing unit in the RUM consists generally of a silty sand unit about 3 to 5 m (10 to 15 ft) thick in the vicinity of 100-H. Concentrations in this unit near the river at 100-H ranged from below detection limits (199-H3-10 and 199-H2-1) to a high of 141 µg/L (199-H3-9) during 2014. This water-bearing unit is connected to the HX system through extraction Wells 199-H4-12C and 199-H3-2C, which started extraction operations in 2009. Concentrations in these wells remain fairly constant at 120 and 65 µg/L, respectively, with a slow decline over time. Near river RUM Well 199-H3-9 also has concentrations over 100 µg/L and is planned for connection to HX during 2015 to improve mass removal from the RUM.

The hexavalent chromium concentrations and distribution in the RUM are shown in Figure 4-21. A plume is not depicted because it has not yet been determined if the water-bearing units are connected. An aquifer pumping test plan is being prepared with the objective of determining if the water-bearing units within the RUM are connected at 100-H, or are small isolated areas. This will also be used to determine if the Columbia River is being impacted by the confined aquifer. This test is anticipated to be implemented during calendar year 2015.

Across the Horn, the highest hexavalent chromium concentrations in the RUM were detected in Well 699-97-48C, at 78.2 µg/L. This was a decline from 105 µg/L in 2013. Approximately 1,100 m (3,600 ft) to the east of Well 699-97-48C, however, the hexavalent chromium concentrations in RUM Well 699-97-45B increased from below detection to 7.40 µg/L. While this is a small increase, it is potentially significant, possibly indicating the front of the hexavalent chromium plume as it moves from west to east across the Horn in this discrete unit (Figure 4-21). This condition will continue to be monitored and additional monitoring wells are planned for installation in this area to provide additional information regarding the extent and range of concentration of hexavalent chromium within the RUM unit in the Horn.

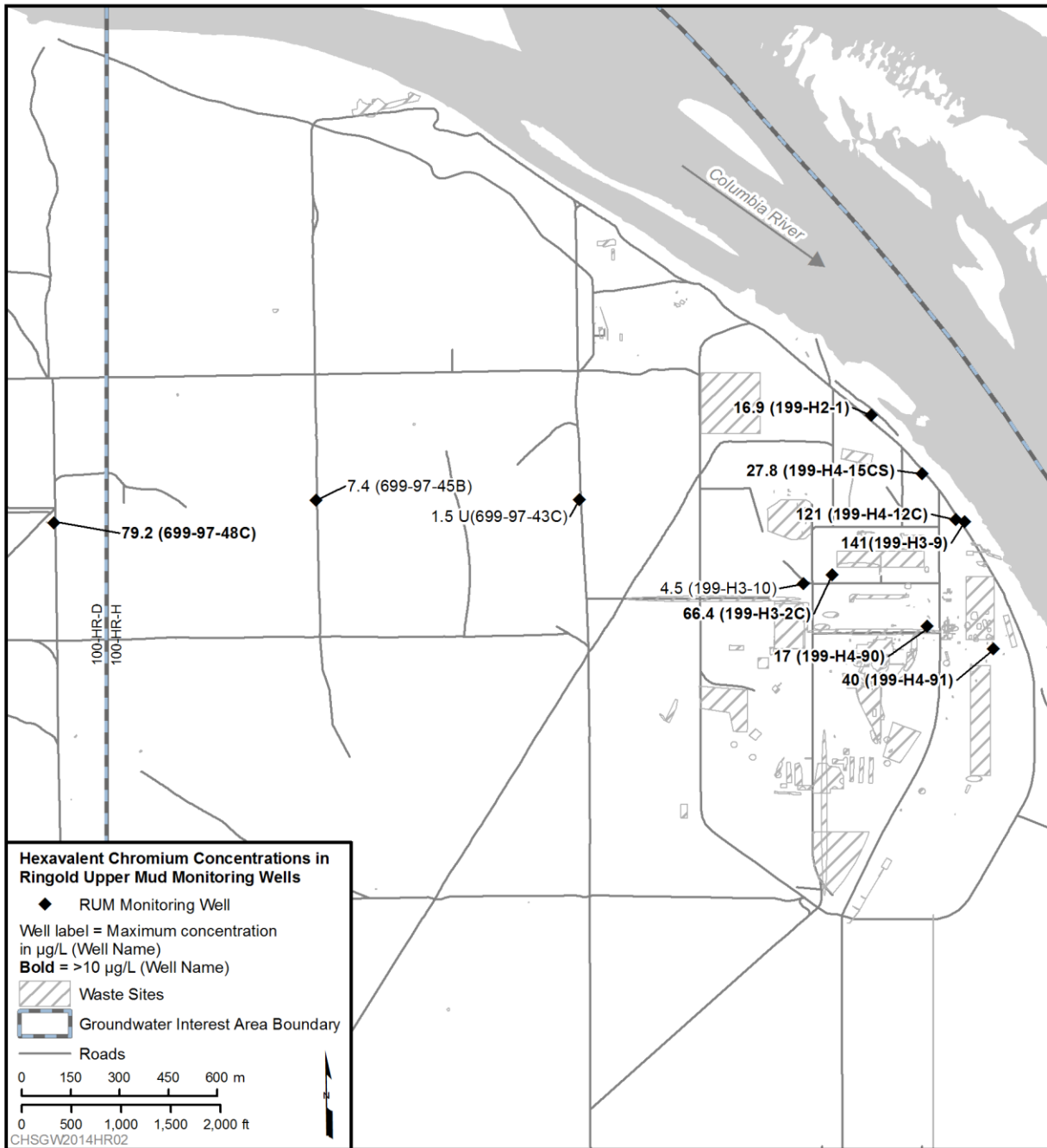


Figure 4-21. 100-HR Hexavalent Chromium Concentrations in the RUM, during 2014

4.5 Nitrate

Primary sources of nitrate in groundwater in 100-HR included gas condensate from the reactors, septic systems and sewer lines, former agricultural practices, and waste sites that received nitric acid. The nitrate plume is primarily co-located with chromium, and has a much smaller footprint at levels above the DWS, mostly within the 100-D Area. Nitrate concentrations continued to exceed the 45 mg/L DWS equivalent in 100-D groundwater in a small area (Figure 4-22). Historically, nitrate has been found above 45 mg/L in 100-H; however, concentrations were below that level throughout 100-H in 2013 and 2014 (Figure 4-23). Nitrate is not found above the DWS equivalent in the Horn. Overall, the combined area of the nitrate plumes continued to rapidly decrease (Figure 4-7), primarily because it is co-extracted with hexavalent chromium.

Nitrate contamination in 100-D was previously distributed in southern and northern plumes, similar to hexavalent chromium. As a result of ongoing groundwater remediation, nitrate concentrations have declined below the DWS in most wells. Only small pockets continue to have concentrations above 45 mg/L. Well 199-D5-155 is now decommissioned but was located within the 100-D-100 waste site excavation and had an average nitrate concentration of 52.3 mg/L. Well 199-D4-20, located upgradient of the ISRM barrier, had a nitrate concentration of 53.1 mg/L in 2014, a decrease from 70.4 mg/L in 2013. Wells with at least one sample result over the DWS for nitrate during 2014 are: 199-D2-6, 199-D4-20, 199-D5-142, 199-D5-155, and 199-D8-97.

Nitrate concentrations did not exceed 45 mg/L in 100-H or the Horn during 2014. The highest levels of nitrate at 100-H found during 2014 were in Well 199-H6-3, located south of the reactor area, at a maximum concentration of 41.2 mg/L (average of 40.9 mg/L). The nitrate concentrations in the remaining area of 100-H and the Horn were below 30 mg/L.

Nitrate concentrations in the RUM remain much lower than in the unconfined aquifer throughout 100-HR. Concentrations in 100-D remain near 2 mg/L (199-D5-134 and 199-D5-141), with concentrations in the Horn ranging from about 2 to 5 mg/L. Nitrate concentrations in 100-H increased in RUM Wells 199-H3-9 and 199-H4-91, with maximum concentrations at 23.5 and 17.1 mg/L, respectively (Figure 4-24). The source of the nitrate has not been evaluated since the concentrations remain well below the DWS and tend to fluctuate. A connection to the unconfined aquifer, however, may be suggested. Concentrations in the remaining RUM wells were generally stable at levels between 2 and 15 mg/L. While the concentrations remain well below 45 mg/L, the increasing trend will be monitored.

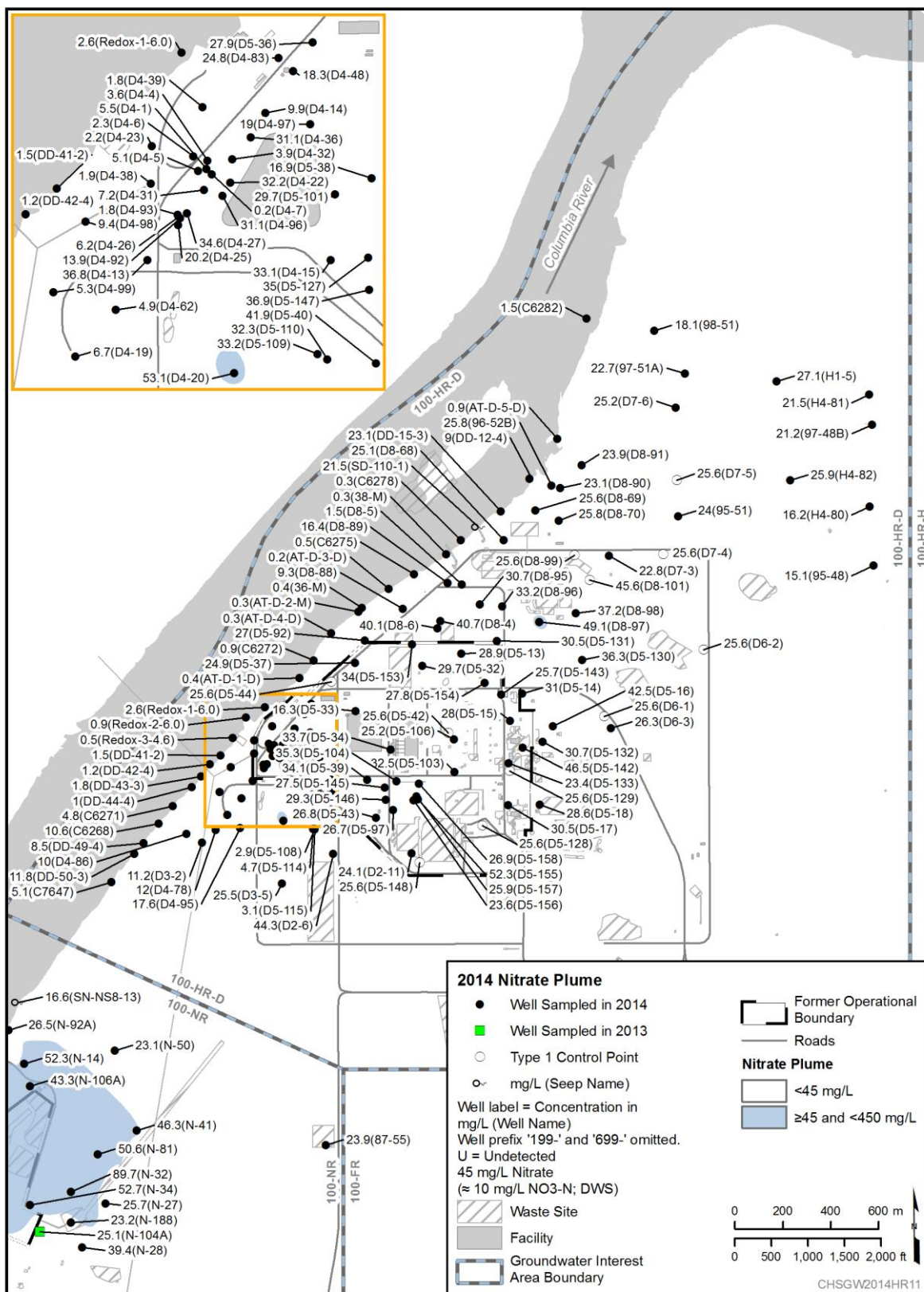


Figure 4-22. 100-HR-D Nitrate Plume, 2014

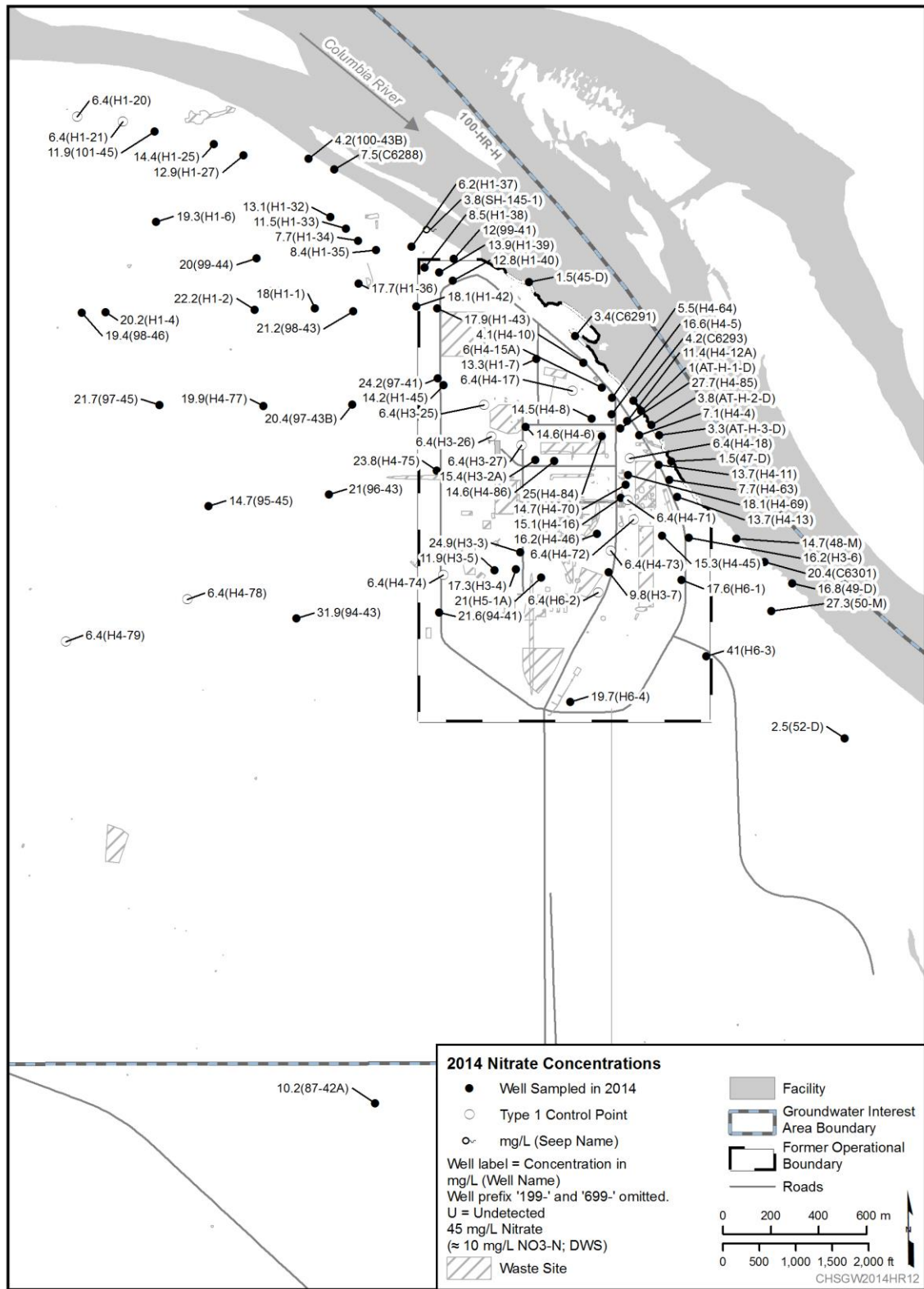


Figure 4-23. 100-HR-H 2014 Nitrate Plume, 2014

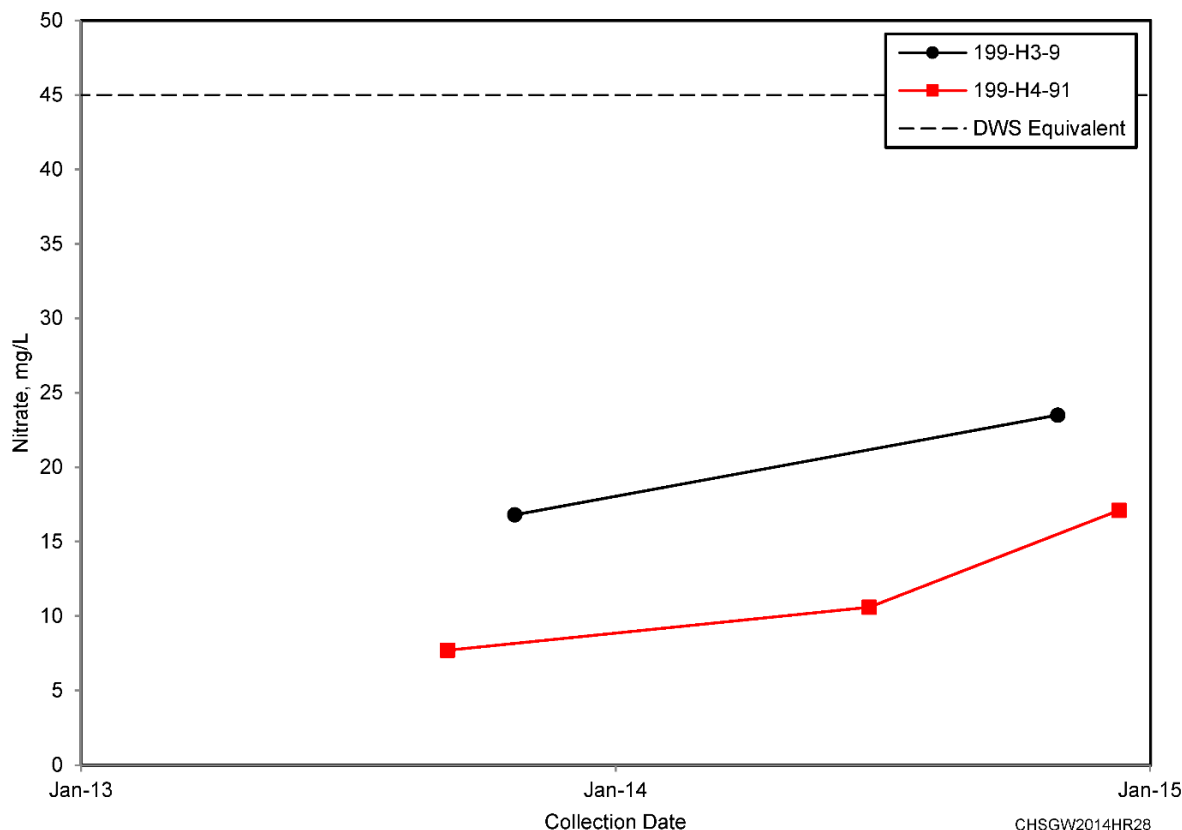


Figure 4-24. 100-HR Nitrate Data for RUM Wells 199-H3-9 and 199-H4-91

4.6 Strontium-90

Strontium-90 has been identified above the DWS in two isolated areas: one in 100-H, and one in 100-D. The concentrations and distribution of strontium-90 have shown little change. Strontium-90 was present in waste disposed of at both 100-D and 100-H. Elevated strontium-90 is associated with isolated source areas in both 100-H and 100-D in the vicinity of the reactors, and is not present in the Horn (Figures 4-25 and 4-26).

In 100-D, groundwater near the former fuel storage basin and waste water disposal trenches at the D Reactor has strontium-90 concentrations above the DWS of 8 pCi/L in two wells: 199-D5-132 and 199-D5-142. Well 199-D5-132 had the highest activity near the fuel storage basin, with a maximum reported value of 36.4 pCi/L in August 2014. Concentrations in this area remain relatively stable. Strontium-90 has not been detected above the DWS in the downgradient wells indicating that the contamination remains localized.

The area near the former retention basins in the northern 100-D Area historically had strontium-90 detections in groundwater. In that area, Well 199-D8-68 had the highest activity with a result of 6.23 pCi/L in December 2014, essentially no change from 2013 values. Strontium-90 values in Well 199-D8-54A were measured twice in 2014, with reported levels of 5.96 and 3.50 pCi/L during high and low water levels, respectively.

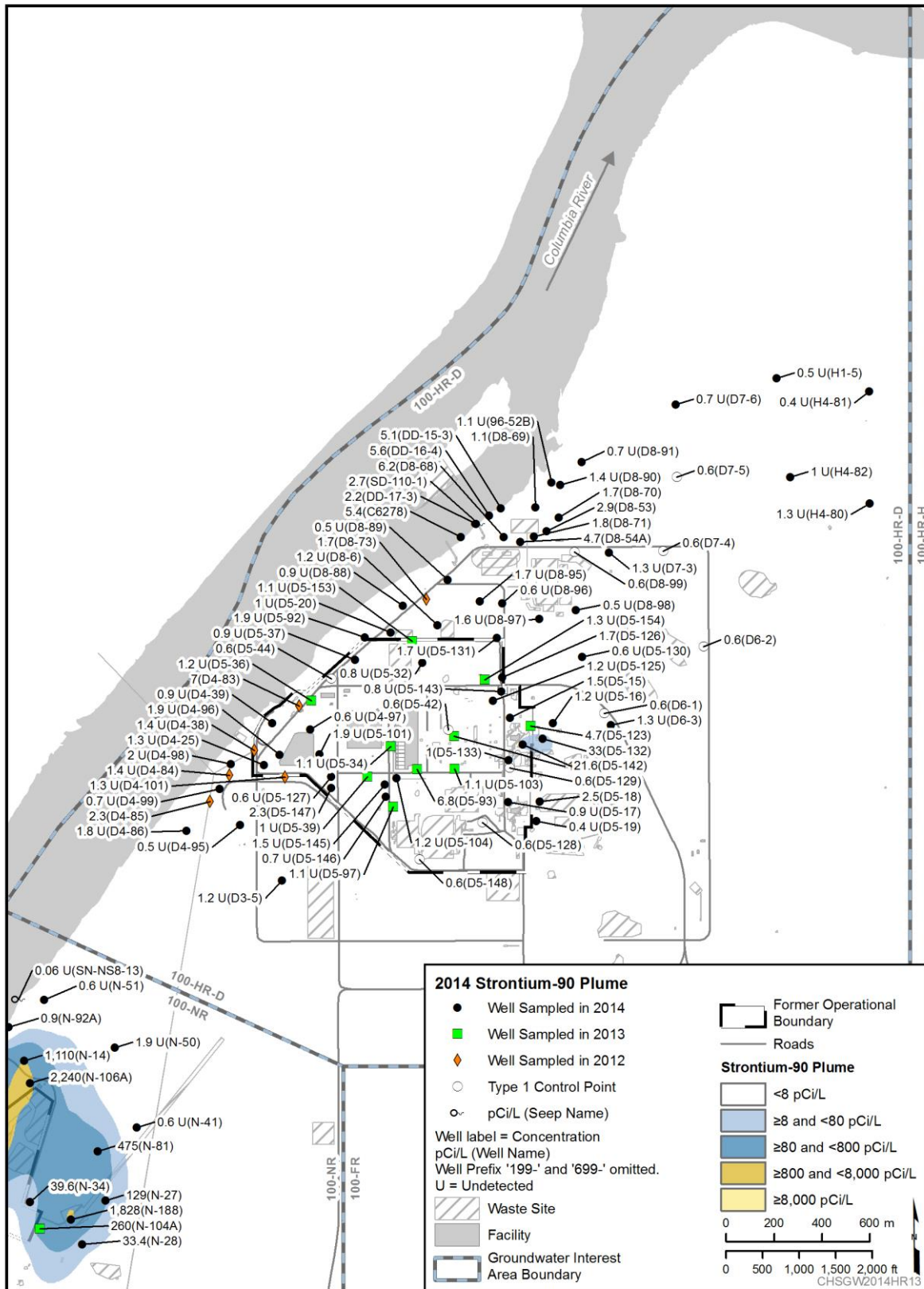


Figure 4-25. 100-HR-D Strontium-90 Plume, 2014

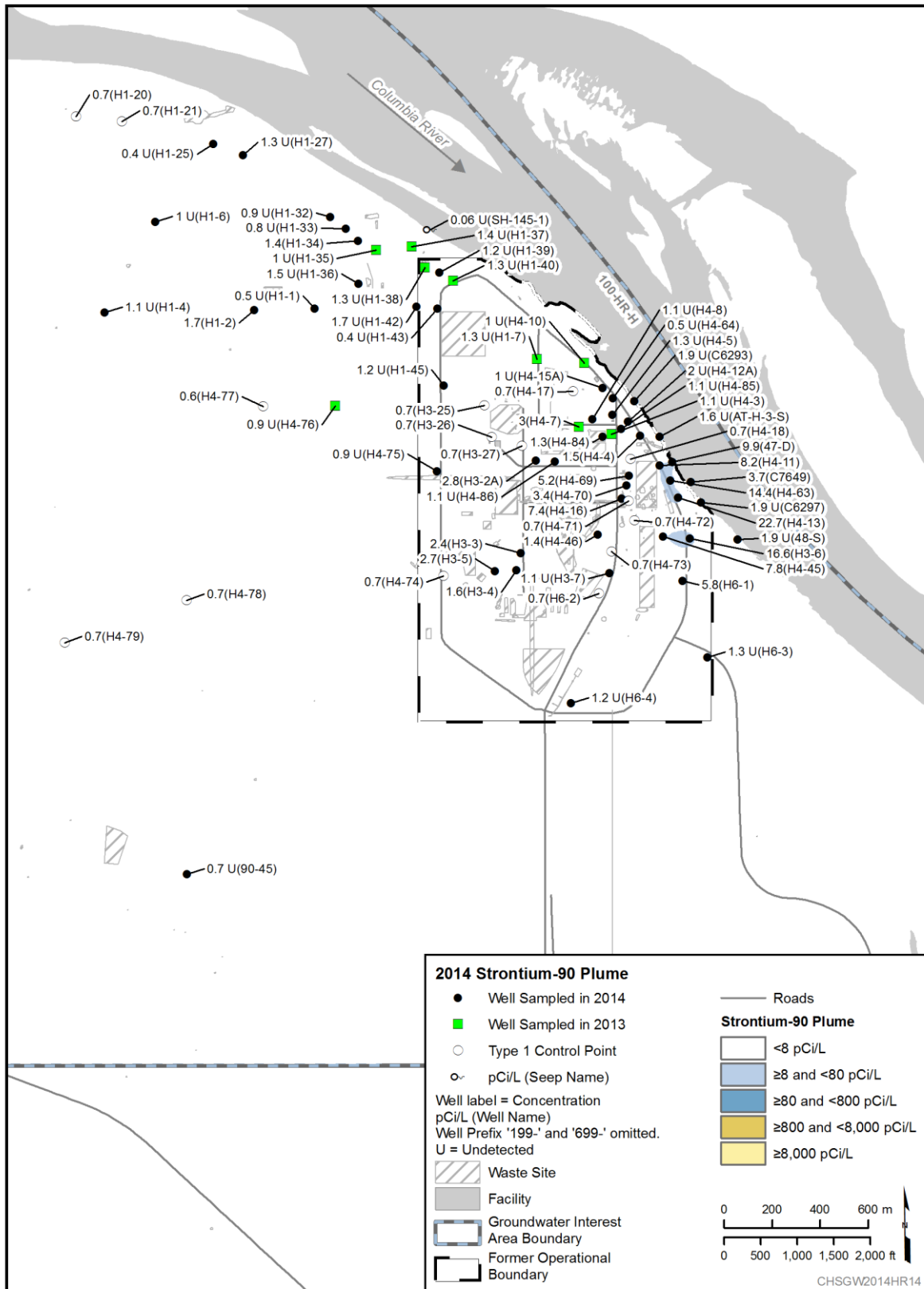


Figure 4-26. 100-HR-H 2014 Strontium-90 Plume, 2014

Historically, two wells to the northeast of D Reactor (199-D5-15 and 199-D5-143) exhibited strontium-90 in groundwater at concentrations less than 8 pCi/L. These observations suggest that strontium-90 in groundwater has been attenuated as the plume moves away from the source area(s) near the reactor.

Aquifer tube samples from the northern portion of 100-D near the 116-D-7 and 116-D-9 Retention Basins were also analyzed for strontium-90 in fall 2014. Strontium-90 was detected in most of the tubes near the basins. The highest detected activity was in DD-16-4, at 5.57 pCi/L. This is consistent with previous years.

Strontium-90 concentrations in 100-H groundwater continue to exceed the DWS near the former 116-H-7 Retention Basin and 116-H-1 Trench (Figure 4-27), located near the Columbia River to the east of H Reactor. Concentrations ranged from 5 to 17 pCi/L in 2014. This is the only area in 100-H with strontium-90 above the DWS, and concentrations remain fairly stable with some seasonal variation and a slight downward trend. Strontium-90 continues to be detected in aquifer tubes along the river shore, with aquifer tube 47-D exceeding the DWS with a concentration of 9.86 pCi/L in 2014. As compared to 2013, there was relatively little change in plume shape or concentrations. The highest strontium-90 concentration detected in 100-H during 2014 was 26 pCi/L in Well 199-H4-13 (March 2014). This monitoring location is close to the Columbia River (within 66 m [218 ft]); the nearest downgradient aquifer tube (C7650) exhibited strontium-90 at about 2 pCi/L in 2014, suggesting that some degree of attenuation of strontium-90 occurs in this vicinity.

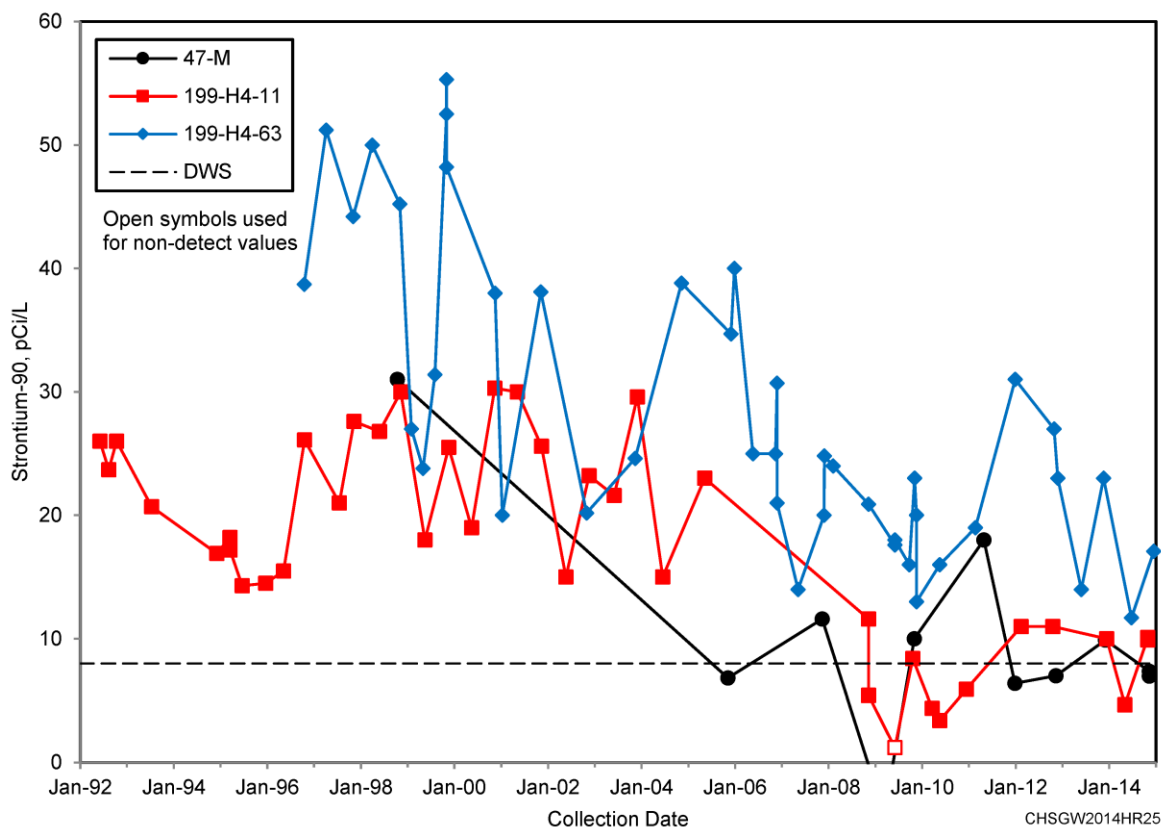


Figure 4-27. 100-HR Strontium-90 Data in Wells near 116-H-1 and 116-H-7

None of the RUM wells are located within the footprint of the 100-H or 100-D strontium-90 plume where concentrations are greater than 8 pCi/L (DWS). In addition, none of the RUM wells had strontium-90 reported above the minimum detectable activity during 2014. Unlike the 2013 results, which did show some low-level detections in 100-H, the 2014 results are consistent with historical data.

4.7 Tritium

Tritium has historically been detected at concentrations near or over the DWS of 20,000 pCi/L in the southern area of 100-D. Well 199-D4-20 had a tritium concentration of 20,400 pCi/L in 2014, which exceeds the DWS (20,000 pCi/L) and was the highest concentrations in 100-D. This well is located in the area of historic detections. Concentrations of tritium in this well have been slowly increasing since 2007.

Tritium has been historically detected above 20,000 pCi/L near the ISRM barrier in the southern portion of 100-D and near the DR Reactor. Overall, concentrations had declined to below 20,000 pCi/L in 2011, and remained below the DWS during 2012. However, in 2013 tritium concentrations in Well 199-D4-20, upgradient from the ISRM barrier, were reported at 20,000 pCi/L. In 2014, the tritium concentrations in Well 199-D4-20 increased to 20,400 pCi/L, exceeding the DWS. Seven wells in 100-D had concentrations above 5,000 pCi/L during 2014, all located in the southern portion of 100-D. Only Wells 199-D4-20, 199-D4-15, and 199-D4-15 had concentrations above 10,000 pCi/L in 2014. Well 199-D4-101 had a concentration of 14,000 pCi/L in 2012 but was not sampled in 2013 or 2014. Tritium concentrations over the past 3 years at 100-D are presented in Figure 4-28.

The source of tritium observed in groundwater in the southern portion of 100-D Area has not been confirmed; several possible sources exist related to historical operations. The tritium may have originated from the 118-D-2 Burial Ground, which experienced a fire in 1958; large quantities of water were applied to extinguish the fire and could have leached contaminants, including tritium, into the underlying formation. During operation of D and DR Reactors, a large recharge mound formed beneath the cooling water retention basins and the emergency trench. This mound could have created a local flow regime beneath D Area that may have caused tritium released from the reactor areas, or the retention basin area, to migrate southward. The tritium concentration in groundwater at Well 199-D4-20 is consistent with concentrations observed over the past decade in wells near 105-DR Reactor (e.g., 199-D5-18 and 199-D5-17). One additional potential source of tritium in the southern 100-D Area is historical operations at 100-N Area. After the D and DR Reactors shut down, a northward groundwater gradient driven by the recharge mound beneath the radioactive waste water trenches at 100-N Area could also have contributed tritium to the southern portion of 100-D Area. Monitoring of tritium in groundwater at 100-D will continue. The tritium concentrations in 100-NR-2 were below 20,000 pCi/L by late 2008 ([DOE/RL-2008-66](#), *Hanford Site Groundwater Monitoring for Fiscal Year 2008*) indicating that it is an unlikely source area for this recent increase.

In the Horn and 100-H, the highest concentrations of tritium were in Well 699-94-43 at 3,500 pCi/L and in Well 199-H4-77 at 3,670 pCi/L. Both of these wells are located in the central Horn area, within the area having higher hexavalent chromium concentrations. The likely source of this tritium is from reactor operations at 100-D and discharge to the 116-DR-1&2 Trench in 1967.

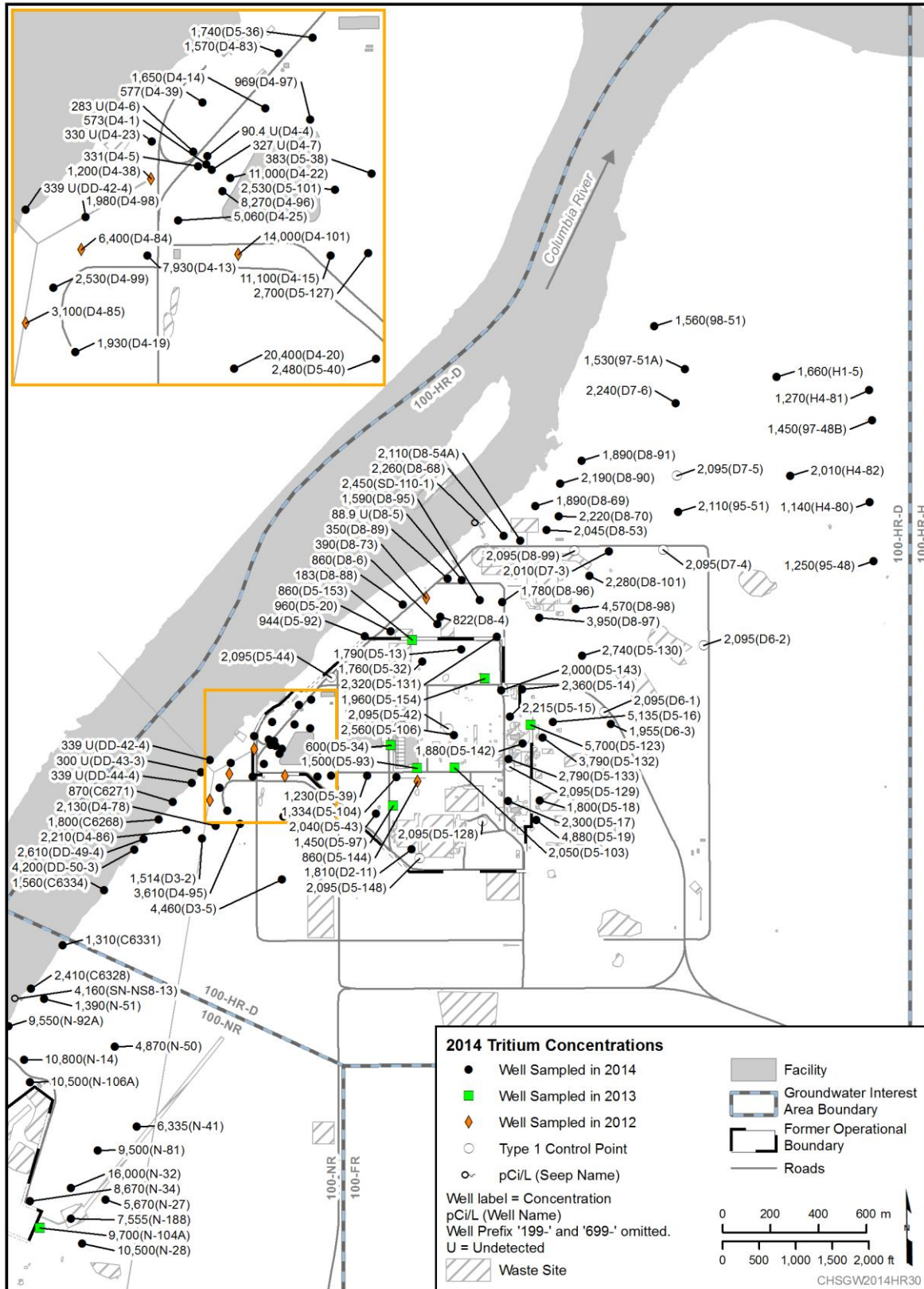


Figure 4-28. 100-HR-D Tritium, 2014

4.8 Uranium

Uranium is present in groundwater near the former 183-H Solar Evaporation Basins in 100-H (Figure 4-29 presents average uranium concentrations in 100-H Area for 2014). The overall 183-H RCRA facility is discussed in Section 4.11. Since 2012, uranium has been detected above 10 µg/L in four wells, all associated with the 183-H basins. Well 199-H4-85 had the highest annual average uranium concentration (13.9 µg/L), with little seasonal variability. Uranium has been detected above the DWS of 30 µg/L in the area of the 183-H basins in only one well since 2012. In 2014 uranium concentrations in Well 199-H4-84 ranged from about 3 µg/L in January to 52.1 µg/L in July. Like hexavalent chromium, uranium concentrations in this well increase with water levels, resulting in higher values during the summer months (Figure 4-30).

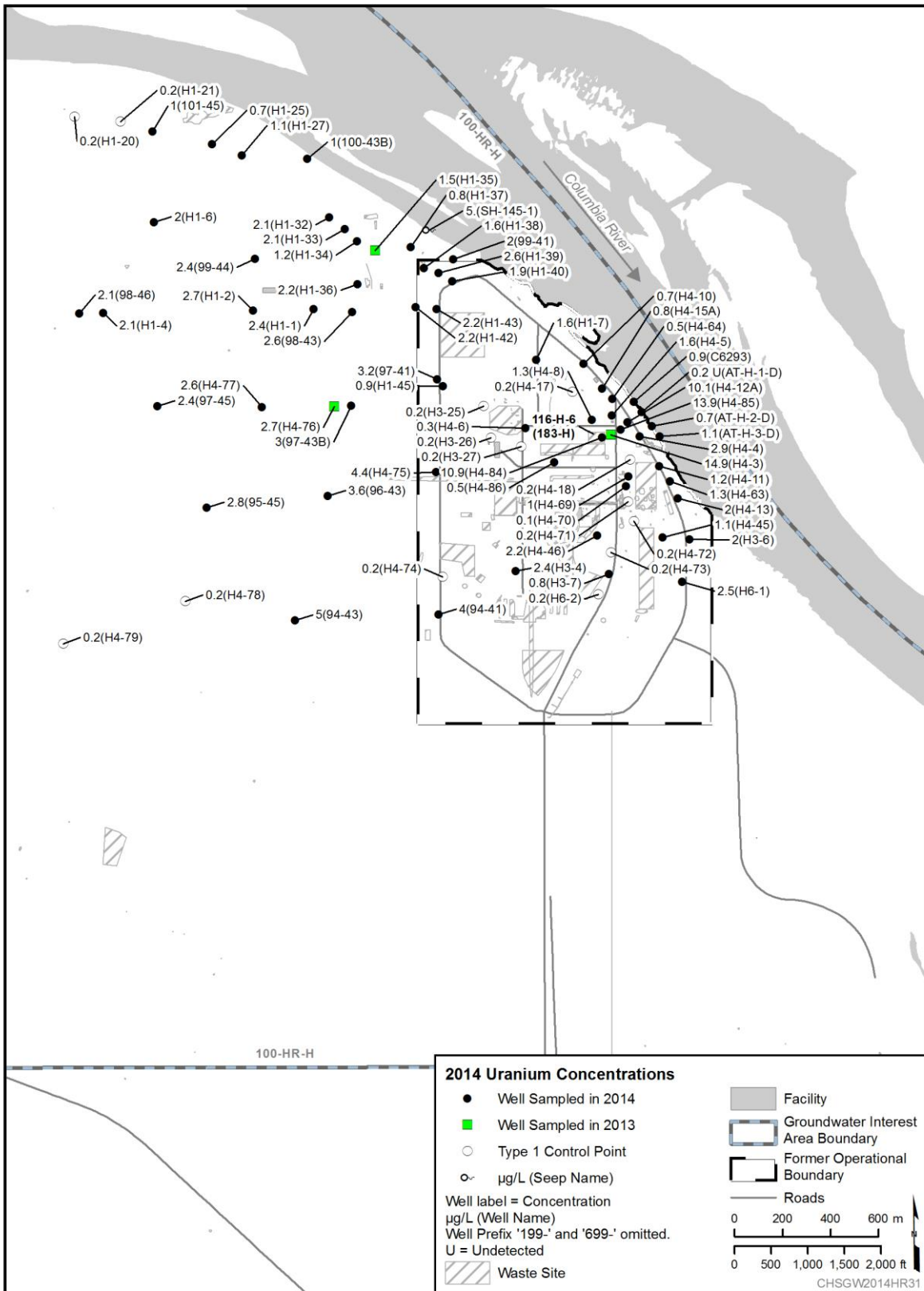


Figure 4-29. 100-HR-H Uranium, 2014

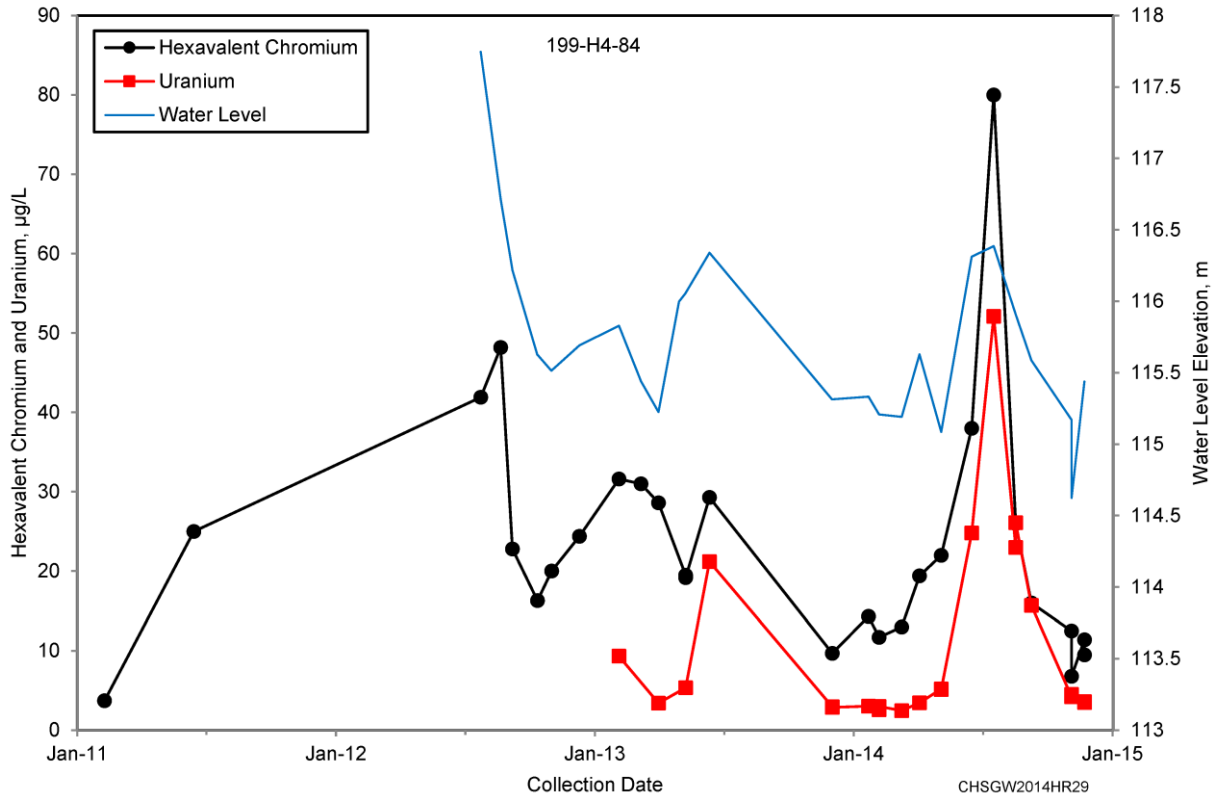


Figure 4-30. Uranium and Hexavalent Chromium in Well 199-H4-84.

4.9 Sulfate

The area around the ISRM barrier in 100-D has historically had elevated levels of hexavalent chromium and sulfate. Sulfate previously exceeded the 250 mg/L secondary DWS in wells within and downgradient of the ISRM barrier as a result of the sodium dithionite solution injections. There were no exceedances of the sulfate DWS at the ISRM barrier during 2014.

Sulfate is being detected at increasing levels in wells located near injection wells. Groundwater that has been treated in the DX P&T system is affected by the addition of sulfuric acid, changing the sulfate concentrations. The acid is used to lower the pH in the influent groundwater because the ResinTech® SIR-700 ion exchange resin treatment technology used to remediate hexavalent chromium is more efficient at a lower pH. Sodium hydroxide is added to the treated groundwater prior to re-injection into the aquifer to neutralize the acid and return to pH to near neutral; however, sulfate concentrations in the effluent are near the DWS, altering the sulfate concentration of the aquifer in the vicinity of the injection wells. The aquifer sulfate concentrations now appear to be stabilizing in areas near injection wells at levels above 200 mg/L, but below the secondary DWS of 250 mg/L.

During 2014, the highest concentrations of sulfate were in the four temporary wells installed at the base of the 100-D-100 waste site excavation (199-D5-155, 199-D5-156, 199-D5-157, and 199-D5-158). These wells are located downgradient from injection Well 199-D5-148. At least one sample from a port in these wells exceeded the sulfate DWS in 2014. The wells are now decommissioned and the waste site is being backfilled in early 2015. Other wells with high sulfate concentrations are also located near or downgradient from an injection well. Those wells with concentrations over 210 mg/L are: 199-D2-11, 199-D5-106, 199-D5-97, 199-D6-3, and 199-D8-101.

4.10 Remedy Summary

Both active (groundwater P&T; Figure 4-31) and passive (ISRM; Figure 4-33) interim remedial actions continued to address hexavalent chromium contamination within the 100-HR-3 OU. The ISRM barrier is monitored but no longer maintained. DOE has been operating a groundwater P&T system in the 100-HR-3 OU since 1997 under an interim remedial action ROD ([EPA/ROD/R10-96/134](#)), which was amended in 2000 ([EPA/AMD/R10-00/122](#)).

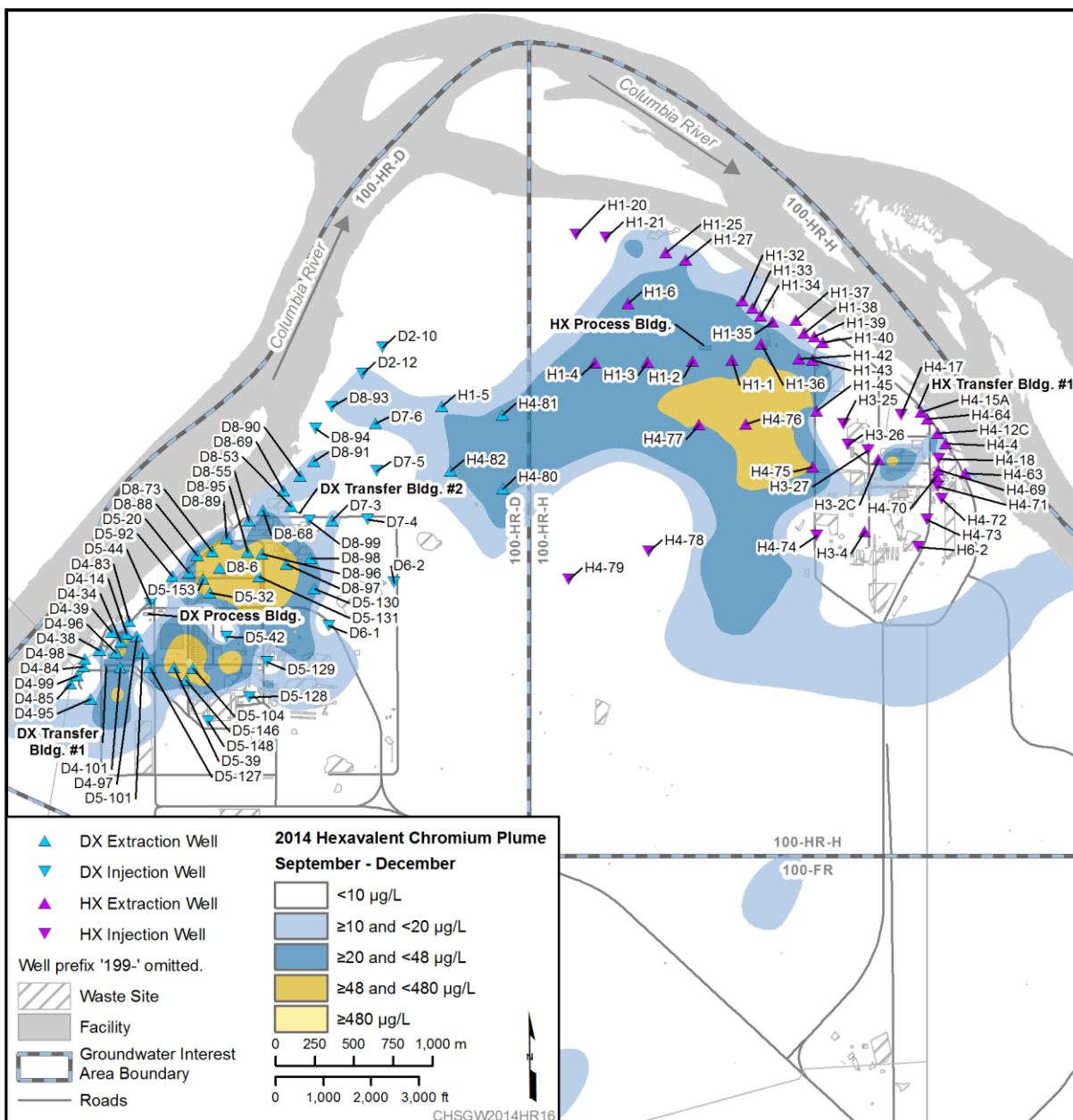


Figure 4-31. 100-HR-3 Remedy Overview

A summary of 2014 operations is provided in Table 4-2. Two P&T systems currently operate at 100-HR-3: DX and HX. These facilities were constructed in response to an explanation of significant difference (ESD) ([EPA et al., 2009](#), Explanation of Significant Differences for the 100-HR-3 and 100-KR-4 Operable Units Interim Action Record of Decision: Hanford Site Benton County, Washington), which expanded the capacities of the P&T system and replaced the existing older DR-5 and HR-3 systems. These systems are described in previous P&T reports (e.g., [DOE/RL-2010-11](#)).

Table 4-2. Summary of 2014 100-HR-3 P&T

Groundwater Operable Unit	100-HR-3	
	DX	HX
Design capacity (L/min [gpm])	2,271 (600)	3,028 (800)
Extraction wells	44	31
Injection wells	10	14
Average flow rate (L/min [gpm])	2,230 (589)	2,237 (591)
Volume treated (million L [million gal]) ^a	1,173 (309.8)	1,177 (310.9)
Hexavalent chromium mass removed (kg) ^a	178.7	22.8
Average hexavalent chromium influent concentration (µg/L) ^b	144.6	20.3
Average hexavalent chromium effluent concentration (µg/L) ^b	<2	<2

a. Total volume and mass of all systems since startup are: 2,240 kg from 12,927 million L (3,415 million gal).

b. Based on field and laboratory measurements

4.10.1 Pump-and-Treat

Due to continuing and effective remediation, the mass of chromium remaining in the aquifer is declining. As a result, the mass being removed from the groundwater each year continues to decline. Most of the hexavalent chromium mass removed from the DX and HX systems during 2014 originated in the interior of the plumes where concentrations are higher. The overall areal extent of the plumes, as defined by the 10 µg/L contour, did not change significantly in 2014; however, the 48 µg/L and 480 µg/L contours illustrate the plume response to remediation (Figures 4-9 and 4-10). Operation of remediation systems and groundwater monitoring results are described in *Calendar Year 2014 Annual Summary Report for the 100-HR-3 and 100-KR-4 Pump-and-Treat Operations, and 100-NR-2 Groundwater Remediation* (DOE/RL-2015-05).

In 2014, the combined systems removed 202 kg of hexavalent chromium from 2,350 million liters (621 million gal) of groundwater. From 1997 through 2014, the combined 100-HR-3 P&T systems removed 2,240 kg of hexavalent chromium from the 12,927 million liters (3,415 million gal) of groundwater. Over one-half (63 percent) of this mass was removed by the DX system, which alone has removed 1,403 kg of hexavalent chromium since operations started in late 2010. Figure 4-32 presents the mass removed by system. Mass removal is slowing, however, as the high concentration areas are being remediated and the overall remaining concentrations have declined.

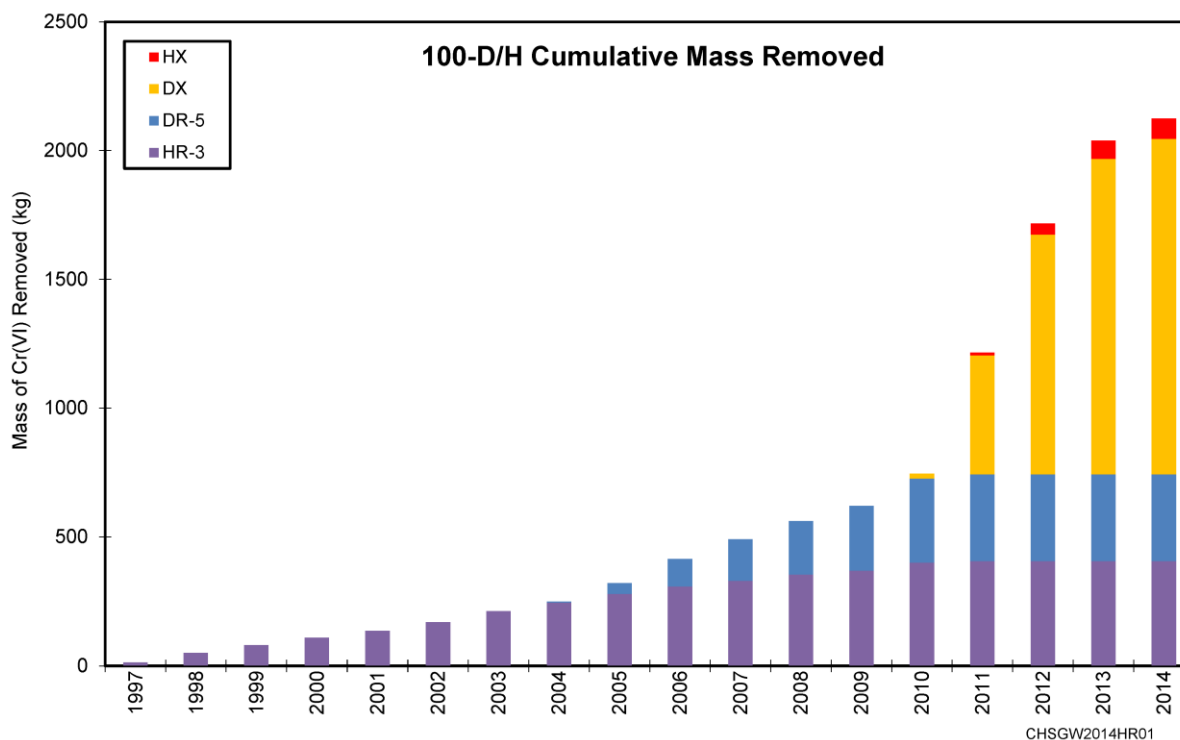


Figure 4-32. 100-HR-3 Pump-and-Treat Mass Removal

A total of 75 active extraction wells and 24 active injection wells operated during 2014, including those that were only operating a short time during the year. System realignments included turning off four previously used injection wells at DX due to poor performance. Those wells are still connected to the system. In addition, Well 199-D5-148 was added as an injection well, Wells 199-D5-146 and 199-D5-153 were added for extraction, and Well 199-D8-55 was converted from an injection well to an extraction well in 2014. Well 199-D5-153 was added to address an area of higher concentrations in the 100-D northern hexavalent chromium plume and to increase capture. Well 199-D8-55 was converted to increase capture along the river in the far north area of 100-D. Operation of remediation systems and groundwater monitoring results are described in DOE/RL-2015-05.

4.10.2 In Situ Redox Manipulation Barrier

In 2000, an in situ chemical treatment technology was added to the existing P&T remedy in the form of an ISRM barrier (Figure 4-33). Due to breakthrough of contaminants at the ISRM barrier, a notice of nonsignificant change to the ROD was issued in 2010, which indicated that the barrier would no longer be actively maintained ([11-AMCP-0002](#)). The notice of nonsignificant change shifted the groundwater remedy at the ISRM barrier to the P&T system. Groundwater at the ISRM site is still monitored, however, as part of CERCLA interim action monitoring, with hexavalent chromium as the target contaminant. In addition, where it is still slightly effective, the barrier treatment process reduces oxygen content in the aquifer; consequently, dissolved oxygen is also monitored.

The ISRM barrier continued to convert some hexavalent chromium to a nontoxic, immobile form (trivalent chromium) in the southern portion of the barrier during 2014 as suggested by the dissolved oxygen profile. The dissolved oxygen profile near the ISRM treatment zone is generally characterized by relatively high dissolved oxygen concentrations upgradient of the treatment zone, decreasing significantly through the treatment zone, and recovering to higher dissolved oxygen concentrations as groundwater flow approaches the river. Dissolved oxygen data indicate the barrier is becoming less effective; however the P&T system capture is improving in that area due to system modifications.

Groundwater samples collected from some wells in the ISRM barrier in 100-D contain concentrations of gross beta above 50 pCi/L, which is the level where additional monitoring is required. This gross beta activity is primarily caused by naturally present potassium-40 in the pH buffer that was used during injection of sodium dithionite (Section 2.5 of [PNNL-13116](#)). The highest gross beta concentration associated with the ISRM barrier in 2014 was 82 pCi/L in 199-D4-19, which is consistent with recent levels.

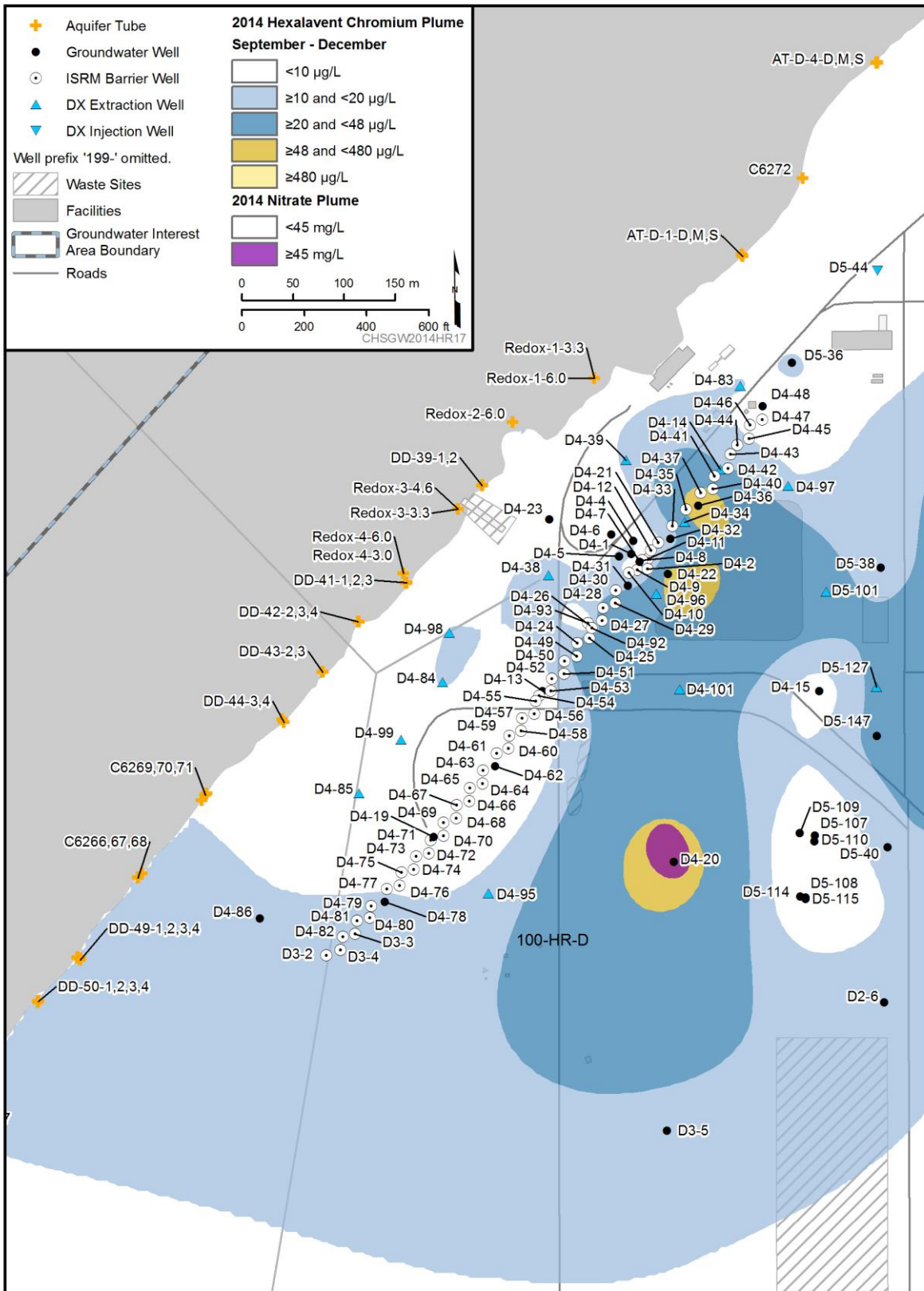


Figure 4-33. 100-HR-3 IRSM Barrier

4.11 RCRA Monitoring

The 183-H Solar Evaporation Basin (Figure 4-34) site is a RCRA TSD unit that consisted of four basins. The basins were originally part of the larger 183-H water treatment facility, which had 12 additional basins. Following decommissioning of the water treatment facility, the four remaining basins were used to evaporate various liquid waste streams, including neutralized, spent acid etch solutions from the 300 Area fuel fabrication facilities. The waste solutions contained various contaminants (e.g., chromium, nitrate, technetium-99, and uranium). The basins were used for waste evaporation from July 1973 until November 1985, demolished in 1995, and contaminated soil was removed from the surface to a depth of 7.6 m (25 ft) bgs beneath the site in 1996.

Groundwater protection was demonstrated through modeling and a modified RCRA closure (soil) was approved in 1997. Clean closure of the site has not been achieved because fluoride and nitrate levels in soil below the 4.6 m (15 ft) deep excavation exceed the “Model Toxics Control Act–Cleanup” ([WAC 173-340](#)) Method B cleanup levels for groundwater protection. Therefore, the unit was closed under the modified closure option, with specified measures for post-closure care.

The site is a post-closure unit in the Hanford Facility RCRA Permit (WA7890008967). Part VI, Chapter 3, Section 3.1.1.2 of the Permit, “[WAC 173-303-645\(5\)](#) Concentration Limits,” identifies Permit limits for dangerous waste constituents (chromium and nitrate) and waste indicators (fluoride, technetium-99, and uranium) and requires annual groundwater monitoring of those constituents. Hexavalent chromium is also monitored, although not specifically required by the Permit. The RCRA wells were sampled as scheduled for the constituents of interest listed in the groundwater monitoring plan ([PNL-11573](#); Tables B-12 and B-14, Appendix B).

The groundwater gradient at the basin is 0.0039 m/m to the northeast, essentially perpendicular to the river. The extents of the chromium and nitrate plumes were discussed previously. Fluoride has not been detected above the Permit limit (1,400 µg/L) since 1999 (199-H4-3) and technetium-99 has not been detected above its DWS (900 pCi/L) since 2005 (199-H4-9).

The current RCRA monitoring wells are Wells 199-H4-8, 199-H4-12A, 199-H4-12C, and 199-H4-84. Uranium concentrations exceeded both the DWS (30 µg/L) and Permit limit (20 µg/L) in July 2014, with a result of 52.1 µg/L in Well 199-H4-84. The uranium concentrations were above 20 µg/L during both June and August but below the DWS, with results of 24.8 and 26.1 µg/L, respectively. Contaminant concentrations in Well 199-H4-84 are directly correlated with water levels with higher concentrations realized during high river stage. By September, both chromium and uranium concentrations had declined, with uranium concentrations down to 15.7 µg/L. Concentrations were below Permit limits for chromium (122 µg/L), nitrate (45 mg/L), and technetium-99 (900 pCi/L) in 2014.

DOE submitted two semiannual reports to Ecology, as required under RCRA corrective action monitoring for the 183-H Solar Evaporation Basins ([SGW-58475](#); [SGW-58600](#); *Post-Closure Corrective Action Groundwater Monitoring Report for the 183-H Solar Evaporation Basins and the 300 Area Process Trenches: January – June 2014; July – December 2014*). The unit will remain in corrective action monitoring until the groundwater contamination is remediated under CERCLA.

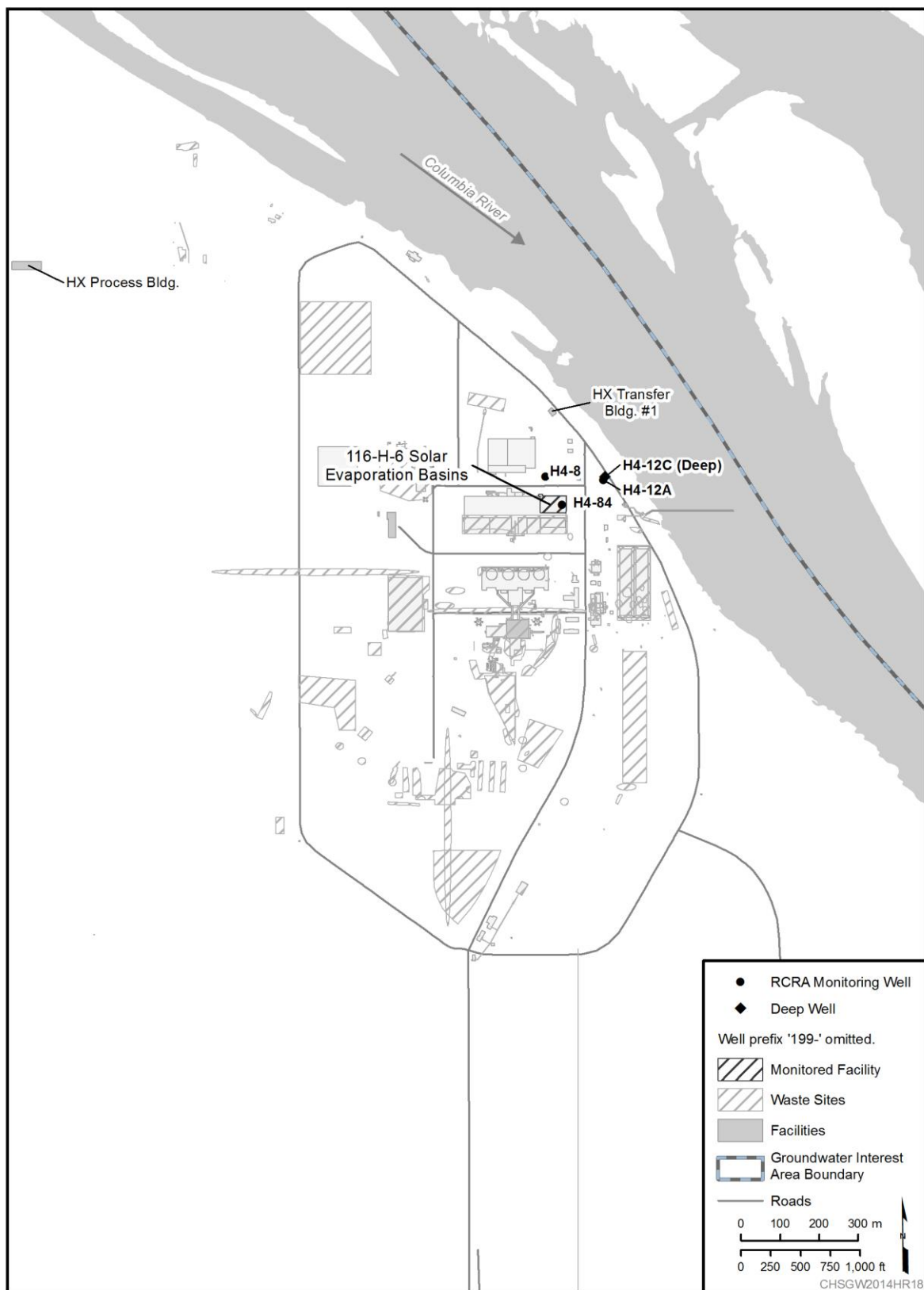


Figure 4-34. 100-HR RCRA Facility 183-H Monitoring Well Location

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